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"OPERATION LUSTY"

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Operation LUSTY

The US Army Air Forces' Exploitation of the
Luftwaffe's Secret Aeronautical Technology, 1944-45

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Editorial Abstract: The bewildering pace of development in aerospace-power technology immediately following World War II was no accident. The author's account of the highly successful efforts of Army Air Corps leaders to exploit German technology at the end of the war is a story that still has lessons for us today.

IN *New World Vistas*, the US Air Force's science and technology (S&T) study of 1995, Dr. Gene McCall wrote about the relationship of technology to the Air Force after almost 50 years as an independent service: "It was clear in 1945 that the technology gains of the first half of the twentieth century should be consolidated to create a superior, technology- and capability-based Air Force which could respond to threats not yet imagined. The world which emerged from the destruction of World War II could not have been predicted in 1945, but the emphasis on technology and capability rather than on assumptions about future geopolitical scenarios served us well as we entered the Cold War." ¹

Technology is fundamental to the culture of the US Air Force. For the most part, this technology culture appeared at the same time as the air service itself, due to the nature of heavier-than-air flight. For nearly a century, technological progress has occurred in starts and fits as well as leaps and bounds, exploding geometrically as it accompanied the visionary efforts of key individuals and programs. In conducting analyses of technological efficiencies in anticipation of tomorrow's complex threat environment, one would do well to consider the past successes of some of these key players in technological development. In particular, a seminal turning point occurred on the heels of World War II as part of a plan to exploit German scientific advancements. The plan was called Operation LUSTY (for Luftwaffe secret technology).

Technological change during World War II proceeded at a frightening pace. Developments in aircraft design, propulsion, weap-ons, and electronics contributed vitally to the outcome of events in the global conflict. At the heart of these developments were scientists, largely civilians, who worked to produce military equipment that would turn the tide of the war. Among them was the youthful Hungarian aerodynamicist Dr. Theodore von Kármán. Since his arrival in the United States from Europe, having obtained Guggenheim funding and hoping to avoid rising nationalism and Nazism, he had become

acquainted with several Army air officers, among them a young major named Henry "Hap" Arnold, who would later command the US Army Air Forces (AAF) throughout World War II.

Since their first meeting at the California Institute of Technology (Caltech) in the early 1930s, Arnold had witnessed the professor's skilled use of mathematical equations to solve complex aerodynamic problems. After inheriting command of the Army Air Corps in 1938 and driven by a near-obsessive belief in the efficacy of scientific approaches to Air Corps problems, Arnold called civilian scientists to a meeting at the National Academy of Sciences building in Washington, D.C., in 1939. Among the visitors was a team from Caltech, including Kármán. At that meeting, Arnold doled out scientific projects, such as finding a solution to high-altitude windshield icing and developing aircraft radios and jet-assisted takeoff (although the term jet was a misnomer). Kármán assigned the difficult rocket project to his most senior students at Caltech, the "suicide club." From that small project grew what is today the Jet Propulsion Laboratory near Pasadena, California. More importantly, Arnold's trust in Kármán grew as the Caltech program continued to tackle the most difficult projects without hesitation. Arnold did not tolerate a "no-can-do" attitude.

By war's end, General Arnold had decided that the AAF was in a position to capitalize on World War II's many technological developments. He also realized that the United States and its Allies by no means led the world in military aeronautical development. He used his influence with Kármán, convincing him to head a task force of scientists who would evaluate captured German aeronautical data and laboratories for the AAF. As the Allies advanced into Europe during the spring of 1945, Kármán's team, close on the heels of the advancing wave, scoured German laboratories. For the AAF, Operation LUSTY began during a supersecret meeting between General Arnold and Dr. von Kármán on the runway at LaGuardia Airport, New York. ²

Only after D day and the realization of several key elements in wartime operations did Arnold believe that Allied victory in Europe was a foregone conclusion. The air war had become a deadly routine. At that point, it was merely a numbers game—Allied air strength versus dwindling Axis air capability.

The Normandy invasion occurred under the umbrella of air supremacy. The P-51 had operated successfully with drop tanks for several months with encouraging results. Additionally, B-29 production had increased to acceptable levels. For the operational needs of combat, this long-range, heavy bomber became Arnold's Pacific trump card. He had devoted a great deal of personal effort to ensure its development, despite severe engine problems initially. Only after assuring himself that these production and procurement programs were succeeding did the general set his sights on developing S&T for the AAF. ³

General Arnold and Dr. von Kármán stayed in "continual conference" after the LaGuardia encounter. Kármán recalled that he was "more impressed than ever with Arnold's vision," ⁴ and Arnold insisted that Kármán examine everything and let his "imagination run wild." ⁵ This challenge fitted perfectly into Kármán's philosophy, including the belief that imagination was a vital part of the invention process. ⁶ To ensure the excellence of this crucial task, Arnold imposed no completion deadline (a luxury he later rescinded) and insisted that Kármán's group travel to many foreign countries, assess their aeronautics programs, and then fashion a bold final report— a viable forecast for maintaining future

American air supremacy. ⁷ Arnold's establishment of the forecasting group itself was totally secret—almost “cloak and dagger.” ⁸ To accomplish his mission, Kármán officially became an AAF consultant on scientific matters on 23 October 1944. ⁹

Kármán's first, unofficial AAF report was organizational in nature, naming as his deputy Dr. Hugh L. Dryden, long-time head of the National Bureau of Standards. November 1944 saw endless conferences and establishment of “relations with the various agencies in the labyrinth of military and scientific aviation.” ¹⁰ Arnold drafted official, written instructions on 7 November, solidifying the LaGuardia Agreement, a four-page letter that set the boundaries for the report of Kármán's group. They were not very restrictive: “Except perhaps to review current techniques and research trends, I am asking you and your associates to divorce yourselves from the present war in order to investigate all the possibilities and desirabilities for postwar and future war's development as respects the AAF. Upon completion of your studies, please then give me a report or guide for recommended future AAF research and development [R&D] programs.” ¹¹ Initially, Kármán's group was called the AAF Consulting Board for Future Research, but apparently AAFCBFR proved too long an acronym, even for the Army. Redesignated the Scientific Advisory Group (SAG) on 1 December 1944, it reported directly to General Arnold. ¹²

Germany's last, desperate attempt to end the war at the Bulge occurred as the scientists gathered, anticipating their chance to exploit the work that German scientists had done over the last five to seven years. In January 1945, Kármán's handpicked, scientific team of “thirty-one giant brains” congregated in Washington to begin the monumental task Arnold had given them. Initially, Kármán met internal resistance to a few of his choices for the group—for example, Sir William Hawthorne, an Englishman. Col Frederick E. “Fritz” Glantzberg, Kármán's military assistant, voiced his objection to having any “foreigners” in the group. Kármán reminded the colonel that Arnold wanted the best people, regardless of their origins. Glantzberg relented, conceding that “the British were, after all, our Allies.” Kármán also insisted upon adding a naval officer, William Bollay (a former Caltech student). When the colonel insisted that the professor had gone too far, Kármán responded with the simple question, “But Colonel, the Navy are surely our Allies too?” After considering this for a moment, Glantzberg finally agreed that they were: “Not as close as the British, but a damn sight closer than the Russians.” ¹³ For administrative reasons, neither of these men served in the group until 1949, but Arnold wanted the best and did not care how Kármán carried out that order. Arnold envisioned and enacted the concept of “jointness” long before the term was formalized in the Pentagon almost half a century later with the enactment of the Goldwater-Nichols Department of Defense Reorganization Act.

A five-star general since December 1944, Arnold insisted that the group throw conservative thinking to the wind. Kármán then reminded the scientists in his quiet, broken English that they had to deliver on their promises. Unsurprisingly, the younger members of the team found working in the SAG the “equivalent of a semester of grad school each day.” ¹⁴ In mid-January 1945, Arnold suffered a severe heart attack and retreated to Florida to recuperate. Fortunately, he had already given Kármán his marching orders. ¹⁵

SAG meetings held during the first weeks in February, March, and April accomplished the basic research and finalized the general format for the report. Kármán emphasized that these spring meetings had a threefold purpose: (1) the SAG would search for ways to secure “scientific insight in a standing Air Force”; (2) it would ensure the continued

interest of American scientists in the future of the Air Force; and (3) the group would educate the American public in the necessity of maintaining a strong Air Force. ¹⁶ These objectives may have seemed remarkably vague, but specifics in design and engineering were not really part of the SAG's overall task. Actually, this sweeping view predated America's entry into the war. In the Pasadena Star News of 24 February 1941, reporters quoted Kármán as saying, "So rapid has been the development of military aircraft during the present war, it is impossible to forecast what performance limits will be obtained by warplanes before the war ends." ¹⁷ For reasons such as this, a broad approach to technology forecasting remained uppermost in Kármán's mind, and he convinced Arnold of the same.

As mentioned above, in late April 1945, SAG members departed for Europe to inspect liberated enemy laboratories. Operation LUSTY, a name that the cosmopolitan, unmarried young professor sardonically suggested was "unlikely but pleasant," fulfilled Arnold's insistence that the SAG investigate the most advanced S&T aeronautical information available worldwide. ¹⁸ LUSTY was the code name for a much larger operational, exploitation expedition of European technologies initiated by the US Army, of which the SAG represented only one small part. Arnold's instructions to Gen Carl "Tooe" Spaatz, commander of US Strategic Air Forces in Europe, were crystal clear: "May I ask . . . in view of the importance of this project that you give it your personal attention." ¹⁹ Already alerted to Arnold's belief in science, Spaatz did just that. In September 1944, while traveling to the second wartime Quebec Conference, Arnold had informed Spaatz of his belief in the "value and the importance of these long-haired scientists." ²⁰ Already, Arnold had secretly established the SAG as proof of this commitment. Spaatz's immediate cooperation was vital to the success of the SAG's contribution to Operation LUSTY.

After the scientists arrived in Paris on 1 May 1945, one member of the team, H. Guyford Stever, observed the critical nature of timing during the Allied advance. He recalled that, although local looting often presented a problem, the advancing Russians were the real concern. More significantly, Stever mentioned that "until this von Kármán mission, we [scientists] had to piece the enemy's facts together. Now we had the advantage of actually talking to the German scientists and engineers, seeing their laboratories, and hearing them describe their total programs." ²¹ Dr. Dryden echoed Stever's conclusion: "I think we found out more about what had been going on in the war in a few days [sic] conversations with some of these key German leaders, than all the running around and digging for drawings and models . . . could bring." ²² Only after Kármán arrived did the group discover the scope of Germany's S&T efforts.

To preserve that scientific picture, the American teams boxed up everything they could and immediately shipped it to Wright Field, Ohio, the AAF's center for aeronautical R&D. First on the scene at one location, Navy exploitation teams quickly boxed up the hardware and technical data in large crates and labeled them "US Navy." Two days later, Army teams made it to the same location, whereupon they crated the Navy boxes in larger crates and relabeled them "US Army." ²³ For these reasons—some good, some ridiculous—immediate access to targets became crucial. Spaatz provided the transportation capability to meet these requirements. ²⁴ His personal involvement in the early days of the SAG's visit to Europe helped strengthen his own understanding of its capabilities during his tour as the first chief of staff of the independent Air Force.

Among the discoveries in Germany during the "scientists' invasion" were rocket-propelled fighter planes, radio-controlled bombs, guided anti-aircraft missiles, and practically every

type of fighter aircraft in the Luftwaffe inventory. The most surprising ones included a jet-powered helicopter built by Doblhoff, swept-back wings hung in high-speed wind tunnels, hidden assembly locations for V-1 and V-2 "vengeance" weapons, and plans for V-3 (intercontinental) rockets capable of reaching targets on the east coast of the United States; many of these rockets were deep below ground in hidden caves. Under the watchful eye of American scientists, including Kármán, German technicians launched several of the V-2 rockets from test sites during the summer and fall months.

Perhaps of even greater significance were thousands of linear feet of data and documents that accompanied these projects—the teams shipped more than 100,000 tons to a London clearinghouse that spring. Upon close examination, many of these German studies confirmed the path that American science had already taken. Some, the jet-powered helicopter for instance (the fourth modification of the original autorotator design), came as a total surprise. ²⁵

After six weeks of traveling throughout the devastated European countryside, the professor met Arnold—now recovered from his January heart attack—in Paris on 13 July 1945 to discuss the team's initial findings. General Arnold, who was traveling to join President Truman at Potsdam, Germany, and did not have much time, asked the professor to prepare a report that summarized the SAG's discoveries. Kármán submitted "Where We Stand" on 22 August, satisfying that request.

This summary of the exploitation of German S&T that Kármán's men had unearthed began by listing a set of eight aspects of aerial warfare which, Kármán believed, had become "fundamental realities":

1. Aircraft- manned or pilotless- will move with speeds far beyond the velocity of sound.
2. Due to improvements in aerodynamics, propulsion, and electronic control, unmanned devices will transport means of destruction to targets at distances up to several thousand miles.
3. Small amounts of explosive material will cause destruction over areas of several square miles.
4. Defense against present-day aircraft will be perfected by target-seeking missiles.
5. Only aircraft or missiles moving at extreme speeds will be able to penetrate enemy territory protected by such defenses.
6. A perfect communication system between fighter command and each individual aircraft will be established.
7. Location and observation of targets; takeoff, navigation, and landing of aircraft; and communication will be independent of visibility and weather.

8. Fully equipped airborne task forces will be enabled to strike at far-distant points and will be supplied by air. ²⁶

Additionally, the report sought to explain why Germany was more advanced in some areas but lagged in others. The title itself reflected Kármán's evaluation of US posture in regard to foreign scientific developments.

For example, the report did not attribute German achievements in aeronautics to superior scientists but to "very substantial support enjoyed by their research institutions in obtaining expensive research equipment such as large supersonic wind tunnels many years before such equipment was planned in this country." ²⁷ These tunnels supported development in the field of transonic and supersonic wing design to the point of "practical application," whereas advanced design ideas were only at the discussion stage in America, spearheaded by Kármán and others after the Volta Conference of 1935.

Kármán's summary added a warning: "We cannot hope to secure air superiority in any future conflict without entering the supersonic speed range." Additionally, the report stated that "V-2 development was successful not so much because of striking scientific developments [but] because of an early start, military support, and boldness of execution." ²⁸ An early start, unlimited funding, and bold execution of German scientific plans became a recurring theme throughout the report.

However, the United States held substantial leads over the Axis in some areas, such as radar development:

It must be realized that radar is not a facility of attachment which will occasionally be used under bad conditions. Rather, the Air Force of the future will be operated so that radar is the primary facility, and visual methods will only occasionally be used. . . . Hence, in an all-weather Air Force, radar must be the universally used tool for bombing, gunfire, navigation, landing, and control. The whole structure of the Air Force, the planning of its operations, its training program, and its organization must be based on this premise. The development and perfection of radar and the techniques for using it effectively are as important as the development of the jet-propelled plane (emphasis in original). ²⁹

Today, this realization appears the most prescient of all those made during a period when the AAF's primary doctrine (in Europe certainly)—that of precision, strategic, daylight bombing—was based largely on the ability to acquire the intended target visually. ³⁰ Kármán also pointed out that the Germans had failed to keep stride with the rest of the world because "most of the development took place in industrial laboratories . . . but the very brilliant group of German physicists in universities were never called in to participate. Consequently, while engineering design was good, imaginative new thinking was lacking." Kármán could detect the absence of imagination and individual brilliance—whether in his students or in notable scientists. Further, he predicted that "the ability to achieve Air Force operations under all conditions of darkness and weather contributes more than any other single factor to increasing the military effectiveness of the air forces. Hence, any research program designed to overcome the limitations to flight at night and in bad weather will pay big dividends." Aware of the rapid improvements in radar

technology, the professor suggested that the Air Force "be alert in swiftly utilizing any new developments."³¹

By emphasizing radar, Kármán also indirectly assured that the Massachusetts Institute of Technology (MIT) would share in future military research projects. During the war, the MIT Radiation Laboratory led the development of American radar. Generally, just as Caltech held the reins of AAF aeronautical science, so did MIT direct AAF radar programs. In fact, the addition of Dr. Edward Bowles to Arnold's staff in 1943 linked radar and electronic programs to the AAF, much as Kármán's association had linked aeronautics in earlier years. The rivalry that developed between these schools was friendlier than Caltech's rivalry with the National Advisory Committee for Aeronautics (NACA). Both schools held particular expertise in different areas of technological development, and, for the most part, each respected the other's accomplishments.³²

After publication of this initial report, Kármán began the arduous task of compiling the SAG's detailed work. Suddenly, the deliberate pace normally associated with scientific research was replaced by a great sense of urgency to complete the project. Fearing radical budget cuts at war's end, Arnold cabled Kármán, still in Europe, wondering if the report might be finalized by 15 December 1945. To accommodate the general's request, Kármán canceled an inspection of Japanese aeronautical laboratories (which he had helped to establish at Kobe in 1927) and sent a few of his team members to the Orient instead. From October through December, work proceeded at a frenetic pace. After many sleepless nights, Kármán had the draft version of the final report, *Toward New Horizons*, delivered to Arnold's desk on 15 December 1945.³³

Kármán's summary volume, *Science: The Key to Air Supremacy*, introduced the classified 12-volume report.³⁴ In essence, this volume amplified the tenets of the August report with a few significant additions. It addressed the problems associated with "research and development from the point of view of the technical requirements which the Air Force must meet in order to carry out its task, securing the safety of the nation." The third chapter elaborated upon correcting the organizational and administrative problems addressed in *Where We Stand*. Most notable of these was a plea for government authority to "foster," not "dictate," basic research.³⁵ This long-range, extremely detailed study was the first of its kind in American military history. Along with *Where We Stand*, it would serve as the blueprint for building the Air Force during the next two decades.

General Arnold was so interested in the possibilities of future airpower development that, based upon Kármán's preliminary report, he offered his personal perceptions of the SAG's importance to General Spaatz. Arnold reminded Spaatz, his successor, that the AAF had no great scientists in its ranks. Military R&D labs had stagnated during the war, largely due to increased production requirements and personnel shortages. The AAF had required civilian help during the war to solve aircraft power-plant and structural- design problems. Only with civilian assistance had the service been able to realize its S&T potential. Arnold reminded Spaatz that "these men did things that the average Army officer could never have accomplished. We must not lose these contacts."³⁶ Today, through organizations such as the Scientific Advisory Board (SAB), the Air Force continues this tradition through a variety of contacts in civilian industry and academia.

Spaatz took Arnold's advice to heart and established the SAB as a permanent group; it met for the first time on 17 June 1946. It was not, however, attached to the commanding general, as Kármán had suggested, but was relegated to Gen Curtis E. LeMay, deputy

chief of the Air Staff for R&D. ³⁷ Nevertheless, the SAB survived postwar cuts by providing scientific advice to higher levels of Air Force leadership. The imperfection of the new system was eventually repaired.

The Arnold/Kármán team, although it existed officially only from November 1944 to February 1946, created the plan that has since evolved into the S&T infrastructure of today's Air Force. Gen Bernard Schriever, father of the Air Force's missile program, once said of Arnold, "There's no question, his greatness was that he created the infrastructure. He visualized the kind of infrastructure that the Air Force needed to really get into the technology age." ³⁸

In addition to the SAG, Arnold established Project RAND and the Office of Scientific Liaison and funded dozens of guided-missile programs before postwar demobilization and inevitable budget cuts slowed the procedure. Kármán and the SAG assumed the strenuous task of traveling the world in search of the most advanced technologies, constantly mindful of how these advances might be applied to American airpower. In the end, Arnold's recognition of the need for such a study and Kármán's unique ability to apply scientific findings to the practical, technological needs of the Air Force—helped along by lifelong associates at opportune times and places—produced a report that had great potential for long-term success.

Such success, however, carried no guarantees. Initially, funds were scarce, and leadership was in constant flux. The reorganization of the National Military Establishment into the Department of Defense only added to the quagmire. Somehow, by the nature of his association with both officers and scientists, Kármán prevented the newly formed SAB from stalling. He nurtured its structure and function in the face of misunderstandings, opposing agendas, and, at times, lack of interest until the board was capable of independent growth. By 1954, a decade after the process began, Kármán's vision- guided by his own perseverance - proved directly responsible for sustaining the SAB. Yet, Arnold's ghost was never far away. During this period, the general's lifelong associations with officers, industrialists, and scientists continually surfaced. Such people as General Schriever, Lt Gen Laurence Craigie, Lt Gen Benjamin Chidlaw, Larry Bell, Donald Douglas, and Dr. Bowles were all vital to the eventual institutionalization of Toward New Horizons.

Only after Kármán was certain that the SAB would thrive did he resign his chair. Similarly, just as Arnold's influence continued to be felt, so did Kármán's. Former students, colleagues, and friends who had been educated by or employed with the professor carried his broad-based, practical-applications approach to problem solving as part of their own methodology—in several cases, into the mid-1990s. Arnold's drive and Kármán's method, embodied in the institutionalized SAB, had become the Air Force's foundation for S&T matters.

Airpower institutions have evolved erratically since World War I. In *Ideas and Weapons*, I. B. Holley concluded that "the postwar [World War I] Air Service made use of only a relatively small portion of the experience of the war regarding the problem of weapons." ³⁹ One lesson learned, however, was that quality was preferable to quantity as far as weapons were concerned. Arnold had internalized that lesson. Unfortunately, administrative organizations that might have assured high-quality weapons development during those years had been neglected. Another lesson learned—perhaps the most significant one—concerned unity of command. According to Holley, "the available evidence shows that after the war the Air Service learned the importance of organization

for decision and established channels of command for unified, decisive, and authoritative action in contrast to the dispersed, ill-defined, and overlapping channels that existed during the war.”⁴⁰ This very development allowed Arnold to act as a stopgap, ensuring that the lessons of the Great War had not fallen on totally deaf ears. Arnold acted as the AAF’s tangible link between the lessons of World War I and the institutionalization of S&T that became reality after World War II. Ordering the blueprint that became the S&T cornerstone of American airpower is one of Arnold’s legacies—creating it is one of Kármán’s.

As hundreds of American military soldiers and CIA operatives rummage through caves in war-torn Afghanistan in search of enemy documents and leaders, we are reminded that we have accomplished similar missions before. The intelligence retrieved during Operation LUSTY was part of the process by which the US Air Force entered its technological infancy. Over the past 60 years, developing air and space technology has created the means to improve the human condition or to bring devastating destruction to unsuspecting enemies anywhere in the world. Lines have become blurred between military and civilian aviation and space technology, just as it is difficult to distinguish among those who utilize these technologies for their own purposes.

Today, it remains clear that technology developments made during the twentieth century should be consolidated to create a superior technology- and capability-based twenty-first-century Air Force that will be able to respond to threats not yet imagined. What is unclear is the kind of world that is emerging from the rubble of the World Trade Center and Pentagon. The emphasis placed upon technology and capability that has been the hallmark of the Air Force over the past half century must be molded more and more by future geopolitical scenarios.

As much as ever before in Air Force history, national aerospace power faces difficult challenges in its quest to achieve desired effects against complex, ruthless, and elusive enemies both at home and on foreign soil. Fortunately, because of the efforts of people like Arnold and Kármán, the Air Force now has many technological tools that contribute to achieving national-security objectives and attaining global stability. Today’s perceived technological superiority is forcing the Air Force and the nation to reassess how best to apply these technologies during the uncertainties already developing during this new millennium.

Notes

1. Gene H. McCall and John A. Corder, *New World Vistas: Air and Space Power for the 21st Century: Summary Volume* (Washington, D.C.: Scientific Advisory Board, 1995), iii. For an examination of the technological culture of the Air Force, see Carl H. Builder, *The Icarus Syndrome: The Role of Air Power Theory in the Evolution and Fate of the U.S. Air Force* (New Brunswick, N.J.: Transaction Publishers, 1994). See also my article “New World Vistas: Looking toward the Future, Learning from the Past,” *Aerospace Power Journal* 13, no. 4 (Winter 1999): 67–76. The author wishes to thank the USAF Historical Research Agency and Air University Press, both at Maxwell AFB, Ala., for their support early in the development of this article.
2. The LaGuardia meeting holds a quiet, yet legendary, place in the history of the Air Force’s S&T development. In his later years, Kármán recalled the meeting but not the details. Arnold’s plane arrived, jostled by the rough winds of a passing cold front, and

Kármán, recovering from recent abdominal surgery, was transported by Army staff car to the end of the runway, where the general joined him after deplaning. Arnold dismissed the military driver and then, in total secrecy, discussed his plans for Kármán and his desires for the exploitation project. Arnold spoke of his concerns about the future of American airpower, and he wondered how jet propulsion, radar, rockets, and other "gadgets" might affect that future. "What do you wish me to do?" Kármán asked with a thick Hungarian accent. "I want you to come to the Pentagon and gather a group of scientists who will work out a blueprint for air research for the next 20, 30, perhaps 50 years," Arnold replied. After promising to give all of the orders on Kármán's behalf (the professor insisted on that caveat), Arnold hopped back in his plane, the deal done. Kármán, flattered and excited, was impressed that General Arnold had the vision to look beyond the war, seeking the help of university scientists. The timing of Arnold's request was not accidental. See Theodore von Kármán with Lee Edson, *The Wind and Beyond: Theodore von Kármán, Pioneer in Aviation and Pathfinder in Space* (Boston: Little, Brown, 1967).

3. Wesley Frank Craven and James Lea Cate, eds., *The Army Air Forces in World War II*, vol. 6, *Men and Planes* (1955; new imprint, Washington, D.C.: Office of Air Force History, 1983), 218–19.
4. Kármán, *The Wind and Beyond*, 267–68; and Clark Millikan to William Knudsen, letter, 3 October 1944.
5. Gen H. H. Arnold to Gen Carl Spaatz, letter, 6 December 1945; and Arnold to Gen Ira C. Eaker, letter, 22 May 1945, both located in the Hap Arnold Murray Green Collection, USAF Academy Library, Special Collections (hereinafter MGC). See also Craven and Cate, vol. 6, 234; and Thomas A. Sturm, *USAF Scientific Advisory Board: Its First Twenty Years, 1944–1964* (Washington, D.C.: USAF Historical Division Liaison Office, 1967), 37.
6. "Disney Folder," Kármán Papers, California Institute of Technology, no. 59.2.
7. Henry H. Arnold, *Global Mission* (New York: Harper and Brothers, 1949), 532–33, reinforced by a cable sent to Spaatz toward the end of the war, 15 April 1945, in MGC.
8. On 25 October, in a reply to a letter from Lt Gen George Kenney concerning future planning, Arnold detailed more than 30 specific actions pertaining to aircraft production and design, but he did not mention the Kármán project, already under way. Arnold added only a brief clue in a postscript: "There is still more that is being prepared now but will not be actuated until the Post-War Period." In a speech to the Aeronautical Research Laboratory of the National Advisory Committee for Aeronautics (NACA) on 9 November 1944, Arnold cryptically told the gathering of scientists and engineers that when the AAF got stuck in a development problem or when it looked toward the future of aeronautics, "normally we go to the NACA and ask you people to do that work for us." But Arnold would not go to the NACA this time. Just as he had secretly given the Whittle jet-engine-development problem to the Bell/ General Electric team in 1941, he now gave the critical task of forecasting the requirements for obtaining future air supremacy to Kármán and his scientists.
9. Scientific Advisory Board (SAB) Office, 1944–1945 file, Pentagon, Washington, D.C.

10. Kármán's first report for the Scientific Advisory Group (SAG), 23 November 1944, in MGC; Kármán to Clark Millikan, letter, 4 November 1944, Kármán Papers, California Institute of Technology, no. 73.6; and Michael H. Gorn, *The Universal Man: Theodore von Kármán's Life in Aeronautics* (Washington, D.C.: Smithsonian Institution Press, 1992), 99.
11. Arnold to Kármán, letter, subject: Instructions for Forecasting Group, 7 November 1944, SAB Office, 1944-1945 file, Pentagon, Washington, D.C.
12. SAB Office, Pentagon, Washington, D.C.; Kármán's first report for the SAG, 23 November 1944, MGC, ref. L/C box 79; Gorn, 99-100; H. H. Arnold Papers, Headquarters Office Instruction 20-76, MGC, L/C box 40; and Arnold to Kármán, letter, 7 November 1944, SAB Office, Pentagon, Washington, D.C.
13. Kármán, *The Wind and Beyond*, 269-70; and William Rees Sears, *Stories from a Twentieth Century Life* (Stanford, Calif.: Parabolic Press, 1993), 219.
14. Kármán, interviewed by Shirley Thomas, cassette tape, University of Indiana Library, 1960; T. F. Walkowicz, "Von Kármán's Singular Contributions to Aerospace Power," *Air Force Magazine*, May 1981, 60-61; and Gorn, 47.
15. Arnold to Lois Snowden, letter, 22 February 1945, MGC. The general described his condition to Lois, his daughter, in mechanical terms: "Apparently one of my cylinders blew a gasket and I had to get down here to have an overhaul job done. . . . While I was here they checked my lubrication, ignition, and gasoline system and they said they were working alright."
16. Sturm, 5.
17. "No Way to Predict Future of Warplane Performance," *Pasadena Star News*, 24 February 1941, Kármán Papers, California Institute of Technology, no. 157.2.
18. Kármán, transcript of oral history interview, n.d., US Air Force Academy Library, Colorado Springs, Colo.; Chester Hasert, National Academy of Sciences, Washington, D.C., interviewed by author, 10 November 1994; and Operation LUSTY folder, Air Force Historical Research Agency, Maxwell AFB, Ala.
19. Lt Gen Barney Giles (for Arnold) to Spaatz, letter, 19 April 1945, Kármán Papers, California Institute of Technology, no. 90.2; Kármán, *The Wind and Beyond*, 272; Gorn, 103-5; and Kármán, oral history interview.
20. In a reply to an earlier letter praising radar developments, Arnold wrote Spaatz on 12 September 1944, affirming his trust in scientists, MGC, roll 12.
21. H. Guyford Stever, Washington, D.C., interviewed by author, 18 May 1995.
22. Hugh L. Dryden, *Columbia University Oral History Review*, 24.
23. Dr. Homerjoe Stewart, Pasadena, Calif., interviewed by author, 21 July 1995.

24. Stever interview. Dr. Stever was working with the British radiation laboratory as part of the MIT exchange team when LUSTY operations began. He was attached to Kármán's group in place of Dr. L. DuBridge, who was unavailable. Stever is a former chairman of the SAB from 1962 to 1964 and a former presidential science advisor.

25. Ibid.; Dr. Richard P. Hallion, interview for New World Vistas, videotape, Office of Air Force History, Bolling AFB, Washington, D.C.; summary of memo from Kármán to Arnold, 30 July 1945, which documented the group's travels to that point, MGC, roll 12; and "History of Operation Lusty, 6 June 1944–1 February 1945," US Air Force Historical Research Agency, Maxwell AFB, Ala., file 570.650A.

26. Theodore von Kármán, "Where We Stand: First Report to General of the Army H. H. Arnold on Long Range Research Problems of the Air Forces with a Review of German Plans and Developments, 22 August 1945," typed manuscript (Wright-Patterson AFB, Ohio: Air Force Materiel Command History Office, August 1945), 1–2. Sturm's USAF Scientific Advisory Board: Its First Twenty Years includes the evolution and decline of the group through 1964. Alan Gropman has nicely summarized the report itself in "Air Force Planning and the Technology Development Planning Process in the Post-World War II Air Force- The First Decade (1945–1955)," in *Military Planning in the Twentieth Century: The Proceedings of the Eleventh Military History Symposium, USAFA, 10–12 October 1984* (Washington, D.C.: Office of Air Force History, 1986), 154–230. Kármán's reports may be found in the appendices of my book *Architects of American Air Supremacy: Gen. Hap Arnold and Dr. Theodore von Kármán* (Maxwell AFB, Ala.: Air University Press, 1997), the only publication in which the Kármán reports are published together and in their entirety.

27. Kármán, *Where We Stand*, 5.

28. Ibid., 8, 12, 21.

29. Ibid., 75–76.

30. Maj Gen Haywood Hansell Jr., to author, letter, 4 October 1979. Although the AAF did accomplish a limited number of area-bombing missions in Europe, these were supplemental to precision attacks in almost every case.

31. Daso, *Architects of American Air Supremacy*, 283–85.

32. Jack H. Nunn, "MIT: A University's Contribution to National Defense," *Military Affairs*, October 1979, 120–25.

33. Kármán, *The Wind and Beyond*, 290; and Gorn, 113–14.

34. Theodore von Kármán, *Science: The Key to Air Supremacy*, summary vol. to *Toward New Horizons: A Report to General of the Army H. H. Arnold, Submitted on Behalf of the A.A.A. Scientific Advisory Group* (Wright Field, Dayton, Ohio: Air Materiel Command Publications Branch, Intelligence, T-2, 15 December 1945), 1.3.

35. Kármán, *Toward New Horizons*, commemorative version (Wright-Patterson AFB, Ohio: Headquarters Air Force Systems Command History Office, 1992), 69–84. Although future attempts were made to repeat the forecast, none made such a monumental impact on the

structure or the vision of the US Air Force. Originals of the Kármán report are located in both the Arnold Papers and Spaatz Papers in the Library of Congress as well as at the Air Force Materiel Command Archives at Wright-Patterson AFB, Ohio.

36. Arnold to Spaatz, letter, 6 December 1945, MGC.

37. Sturm, 14–15.

38. Bernard A. Schriever, Washington, D.C., interviewed by author, 10 November 1994.

39. I. B. Holley Jr., *Ideas and Weapons: Exploitation of the Aerial Weapon by the United States during World War I: A Study in the Relationship of Technological Advance, Military Doctrine, and the Development of Weapons* (1953; new imprint, Washington, D.C.: Office of Air Force History, 1983), 176. The following discussion is based on Dr. Holley's summary and conclusions.

40. *Ibid.*, 177.

Contributor

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Source: AFHRA Reel # C5098, "U. S. Air Forces in Europe". Intended to be a press release, but never released. This may be its first appearance. Researched and contributed by Bf-109 (T2-123 & 124) researcher, Richard Corey.

At a medieval inn near Thumersbach near Berchtesgaden, early in May 1945, the German General Air Staff patiently awaited the outcome of surrender negotiations taking place in the North. They had arrived by car and plane during the past weeks, when the fall of Berlin was imminent, and had kept in contact by radio with Admiral Doenitz at Flensburg. Through the interception of one of these messages, their location, which had previously

been unknown, was discovered. Within twenty-four hours Lt Col. O'Brien and his small party, representing the Exploitation Division of the Directorate of Intelligence, USAFE, had arrived, located the party and conducted the first of a series of discussions with General Koller, who was then in command. All documents and records that had been brought by the High Command were immediately turned over, and the first unearthing of buried records and documents, in and around Berchtesgaden, as well as the initial interrogation of the staff officers present, took place.

A casual remark made by a technical engineer, who stated that he had recently been offered a position in Japan, led to his being thoroughly interrogated for significant technical information. As an aside, and what he probably considered a relatively unimportant incident, he stated that less than a month ago, about the middle of April, ten submarines heavily loaded with the latest German equipment relative to aerial warfare, were dispatched from Kiel to Japan. When Lt Col. O'Brien was thus informed he immediately advised the Directorate of Intelligence, USAFE, who in turn notified the Japanese Intelligence Section of SHAFE. A cable was then dispatched to all commands.

In every theater of war. All vessels in ports and at sea were notified, and one of the biggest searches ever undertaken during the war for submarines was initiated. What route they had taken, whether they had gone alone or together, no one knew. But so extensive was the search and so carefully was it executed by warships of all Allied nations, that by the end of June, six of these ten submarines had been captured intact, some a relatively short distance away from their bases, others perilously close to Japan.

In a mountain aide near the camp of the German Staff officers, an air raid shelter had been blocked up and then carefully covered and concealed with dirt. Its presence was eventually revealed by the officer who had directed this concealment, but only after he had noticed that a hole, large enough for a man to crawl through, appeared in one of the sides. Thinking that the cache had been discovered, he explained to the USAFE party the

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location of the shelter, informed them that he had been in charge of the burying of some extremely important records of the High Command, and would be glad to supervise their excavation. When the contents were eventually removed, one important document after another was laid out and carefully examined. One file contained correspondence from 1 Gruppe/6 Abteilung, German Air Ministry Intelligence, dated January 1943 to March 1945, concerning the supply to Japan of all types of equipment for aerial warfare, including models of Me 262 and Me 163, quantities of V1 equipment, high explosives, incendiary bombs, bomb sights, radar apparatus of all description, including models of the Wurzburg and Freya radio and signals installations, telephone, teleprinters, and so forth, and all types of aircraft parts. Another contained the precise location of every plant in Japan presently engaged in the manufacture of the latest aerial plane designs, every research institution connected with the Japanese Air Force, and, many vital targets hitherto unknown and unsuspected by Army Air Force Intelligence officers. These volumes were flown at once to Washington, D.C., and shortly thereafter bombers of the 20th Air Force were doing precision bombing of the secret targets whose existence had been disclosed in the documents captured at Berchtesgaden.

A report reached Lt Col O'Brien's party that a "strange aircraft" had been seen in a

mountainous retreat near Salzburg. Investigation quickly determined that this "strange aircraft" was a jet-propelled helicopter, the only one of its kind in the world. The inventor and his entire staff, who had laboriously worked ten years to perfect it, were present, guarding his invention as one would a precious jewel. The helicopter was examined, and a preliminary superficial interrogation of the staff was sufficient to reveal its tremendous importance. It was carefully loaded in a large truck and taken to Munich. From there it was sent across Europe to France, placed on a boat and shipped to Wright Field, together with the confiscated notes, drawings, and meticulous records of experiments conducted by the scientist and his assistants. After lengthy and detailed interrogations of these persons by technical experts assigned to USAFE, the men were sent to P/W cages. After ten years of labor they were left with only their memories of a remarkable technical achievement. The only jet-propelled helicopter in the world had been found and disposed of in such a way that it would prove advantageous to American scientists and the government.

The presence of the USAFE party at Berchtesgaden before surrender negotiations had been concluded, the interrogation of a technical engineer and the subsequent seizure of six submarines, the unearthing of a detailed list of important and unknown Japanese laboratories, plants, and factories, the finding of a jet-propelled helicopter, and invaluable documents and records of the German General Staff, was neither accidental nor the result of fortuitous circumstances, but rather the outcome of a well-defined and executed policy known as "OPERATION LUSTY", which

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was the code designation for a project with a priority equal to those of military operations that had been put into immediate effect on April 1945. This project was a combined effort of the Exploitation Division of the Directorate of Intelligence, USAF, and the Disarmament Division or the IX Air Force Service Command. Its mission was the complete and minute exploitation of air intelligence and technical air objectives in liberated and hostile countries, which at that time were divided up into zones either already occupied or to be presently occupied by the 6th, 12th, and 21st Army Groups.

There was a substantial foundation for the belief that the Germans had made many, if not all, of their recent scientific developments available to the Japanese. The knowledge of these developments, consequently, was vitally needed to devise effective technical and tactical countermeasures, and to insure the technical superiority of our own equipment in the war in the Pacific. In February 1945, officers at Wright Field had prepared a list of enemy equipment, which subsequently became known as the CATEGORY "A" LIST, that they desired for technical intelligence and research purposes necessary for the execution of the above needs. This list, which was later supplemented and revised in the light of discoveries made, became the guide and working manual for teams later sent into the field by the Exploitation Division to discover, guard, and dispatch material for the expressed intelligence purposes. Headquarters, Army Air Forces, also prepared a large detailed pamphlet entitled "Air Staff Post Hostilities Requirements", which was an outline of proposed studies to be written on the German Air Force from evidence subsequently to be unearthed, discovered, and captured by members of the Exploitation Division. Thus, the exploitation logically fell into two categories: Technical and Non-Technical.

The Technical Intelligence Objectives were classified in two categories: (a) equipment or documents of immediate interest and value to technical research centers in the United States for evaluation and immediate application in the war against Japan, and (b) equipment or documents of interest to technical research centers in the United States for extended period of study and development. The Non-Technical Intelligence Objectives included the obtaining of equipment and information that would fulfill, in part, the requirements as outlined in the "Air Staff Post Hostilities Requirements". In general, these included the finding of such material as would enable officers to prepare scholarly reports on every aspect of the German Air Force: Organization & Personnel, Records & Reports Systems, Tactical Employment, Training, Installations, Air Defense, Maintenance & Supply, Aviation Medicine, Intelligence Organization and Procedures, Flying Safety, and Weather.

To handle, expeditiously, captured German aeronautical and industrial equipment the Directorate of intelligence set up

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three collecting points in the forward area on 1 May 1945: Merseberg, Nuremberg, and Stuttgart airfields. Additional sub-collecting points were also established to feed the main centers. Later, when Merseberg fell under British jurisdiction, after Germany had been divided into zones, it was closed, and Munich, which eventually became the chief collecting center, was opened. Each of the points was maintained by technical personnel thoroughly acquainted with the type of intelligence material desired and the necessary equipment to explore all technical intelligence targets in the areas. An ATI (Air Technical Intelligence team control section) was established at each collecting point to supervise the several hundred mobile ATI teams, which usually consisted of two to four technicians and a driver fluent in German, exploiting both technical and non-technical targets in the forward areas. Captured technical equipment was taken to one of the collecting points where it was flown either directly to Washington or Wright Field, depending upon its importance, or across Europe to shipping ports in France. Technical documents and reports were likewise sent to collecting points and from there to the Air Documents Research Center in London, which was specifically set up to receive the thousands of sheaves of documents being sent from the various collecting points in Europe.

These ATI teams, upon whom fell the often laborious task of ferreting valuable information from German civilian scientists and enemy personnel who were frequently reluctant to talk or to tell the truth, were composed of perhaps the most heterogeneous group of men ever collected in the army to execute a valuable and important job. There were Army officers and enlisted men fluent in German, Austria, Russian and the Slavonic languages, skilled lawyers, scientists, research scholars, historians, and technical representatives from such corporations as Bell Aircraft, Jack & Huntz, Western Electric, General Electric, Standard Oil, Sperry, Packard, Boeing, Bendix, Detroit Broach, Remington Rand, and Victor Adding Machine. In six weeks of operation they had exploited more than five hundred important targets and interrogated hundreds of eminent German scientists, research professors, technicians, and workers.

The difficulties encountered by ATI teams sent into the field to investigate a target: were numerous and complex, offering, in some cases, no reward, or little at all, after days of laborious travelling, often in foul weather, over deteriorated roads, and after gruelling

hours of interrogation in unfavorable circumstances. The information given a team about a target, moreover, was often too vague for quick and successful exploitation, and the quest frequently turned into a sleuthing job with information so scanty that a well-trained detective would have despaired. Excerpts from several reports from such teams present a graphic picture of the discouragement and difficulties so often encountered:

"Of the 11 cases of ZWB (Central Publishing Agency for German Scientific reports) in a chapel", writes an Air Force officer in charge of a team sent to investigate

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German Research Installations at Schloss Pullach/Aibling in Bavaria, "5 were empty.....Herr Becker explained that Herr Strohmeier, the Secretary of the Lilienthal Gesellschaft, had disposed of them.....

when the latter showed up, we were able to interrogate him in Becker's presence. The result was a considerable flop on the part of both gentlemen, since Strohmeier told an entirely different story. After hours of heated interrogation, Strohmeier gave way and led us to a spot in the garden where we ultimately recovered about a ton of buried documents. There was also a smaller hoard which he yielded up."

In search of additional documents, the President of the Lilienthal Gesellschaft was interrogated at Schloss Pullach, a few kilo-meters away.

"He had no documents and told substantially the same story as Strohmeier that the documents had been conveyed by rail from the Schloss to a "Tischlerei" in the Mittel Zelle Church. When the French Army approached, Baeumker and Strohmeier first tried to throw the cases of documents in the lake in the hope that they would sink, but that failed. Then they got a number of people together and burned the lot on the beach. This took them two days, and they were barely able to get back to Schlagenhofen and Bibling respectively before occupation."

From Pullach the team went to Ainring in an attempt to locate the Forschungs-Fuehrung After two days of investigation they found.....

"that the greater part of the important documents was gone, and that the place had, in general, been cleared of interesting documents by occupying troops as well as looters, although a substantial quantity of peculiar airplanes and mechanisms remained on the fieldwe found our main problem the necessity of locating the "Forschungs-Fuehrung, over which Georgii had presided.

After much travelling in quest of the members of the "Forschungs-Fuehrung" , the team located some of them on a cart road near a swamp.

"These people were briefly interrogated and proved to have very few documents or anything else left all parties told the same story of the fate of the major portion or their records, namely, that they were destroyed by fire and bombs in a raid. The Germans in the area were thoroughly spoiled and had lost most of their rear of us."

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In locating desired target intelligence, teams all too frequently found German personnel reluctant to reveal the location of missing material, which, they claimed, was usually either already burned, destroyed, or forever lost. They manifested a reluctance to speak, deliberately lied to mislead, the intelligence workers, or feigned complete ignorance of the subject under question. One team captain in a report of a trip that took his party to survey the Luftfahrtforschungsanstalt found that....

"there was always some kind of a Restkommande" Jerry waiting to give a conducted tour of whatever we were investigating; generally someone surprisingly well informed The appearance of these various individuals so ready to collaborate with us is part of a pre-arranged plot controlled by unknown parties with the following objectives:

- (1) To keep a close check on our activities and to learn our purpose from our questions.
- (2) To establish themselves, especially in the factories and other concerns, as a kind of quisling government, operating under our nominal and their actual control.
- (3) To guide us away from really important information.
- (4) To make themselves indispensable and so keep alive the framework of the IVth Reich.
- (5) To sow dissension among the various allied governments. (This might easily take the form of claiming that certain vital records have fallen into the hands of another government.)"

But, on-the other hand, there were many scientists willing and anxious to collaborate and work for the United States. Various team captains stated over and again in their reports that the better grade scientists were not ill-disposed toward the Allies.

"They seem to regard", one wrote, "the initial stages of the occupation as a temporary and regrettable interruption of their work, and are interested only in continuing their activities under any auspices. They do not understand why the Allies do not put them to work at once for our purposes. At Gottingen, some asked if they could not get grants of money from American institutions, such as the Carnegie Institute, for resuming their work..... There is no evidence". he concludes, ' "that the war has changed moral values; but rather evidence to the effect that the loss of the war is regarded merely as an unpleasant and passing material incident. The hazard .of continuing any scientific war work in Germany, even under the closest supervision, is all too . obvious.

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Team members often found, after initiating the exploitation of targets, that there were clues at each target which lead to others unknown: these usually were investigated at once. Quite frequently it was discovered that the Germans had almost always abstracted the documents they considered most valuable, generally hiding rather than burning them. Under pressure, however, their presence was revealed, quite frequently in lakes, swimming pools, mines, barns, buried in closed over shelters, tucked away in attic corners or in cellars of houses scattered over the country, in jails, insane asylums, or even grocery stores.

This detailed search throughout Germany, specially made to capture technical equipment to further our war against Japan and to provide research and materials for extended

periods of study and development, was responsible for the successful and quick completion of scientific developments upon which the Government had already been directly or indirectly engaged. As ATI ordnance flak, armament, electronics, and other exploitation teams, fanned out in their extensive and exhaustive searches through arsenals, laboratories, factories, supply dumps, and airdromes in Germany, one important high priority target or opportunity and one combined intelligence objective target after another were investigated and exploited to the maximum.

The targets briefly discussed below may serve as illustrative examples of the tremendous scope and nature of exploitation that took place under the name of "OPERATION LUSTY". One may reasonably be assured, moreover, that in this exhaustive intelligence search nothing of importance escaped detection, examination, and subsequent application. Practically everything of importance that was obtained and accomplished was done so during the first six operative weeks of the project, when it was so imperative that every technical effort be made to bring to a quick and successful conclusion the War in the Pacific.

(1) The Hermann Goering Aeronautical Research Establishment, located near Brunswick, yielded the greatest return in the field of research. Members of the Exploitation Division arrived on the 22nd April to organize and conduct the scientific exploitation of this establishment. Dr. Von Kaman, General Arnold's personal aeronautical advisor, and his Group, remained at this place, on several occasions for periods varying from several days to a week. According to Dr. Von Karman, seventy-five to ninety per cent of the technical aeronautical information in Germany was available at this establishment, and that information on research and development which had not previously been investigated in the United States would require approximately two years to accomplish with the facilities available there. Information obtained on jet engine developments available at the Goering establishment, it was stated, would expedite the United States development by approximately six to nine months. In less than two months, one hundred and nineteen reports were written on the facilities,

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the research conducted there, and on the interrogation of many of the German scientists previously employed in the various institutes. The permanent members of the organizing party recovered from localities, as far as 50 kilometers from Brunswick, large quantities of buried and hidden documents and equipment which had been removed by the Germans to prevent their falling into the hands of Allied forces.

(2) During the exploitation of the aviation fuel objective - of which the I. G. Farben Ind. at Ludwigshaven and Leuna, was the largest and most important - - concealed documents were uncovered and interrogation of key personnel made with respect to the fuel for the conventional Otto-cycle aircraft engines, fuel for jet aircraft power plants, and fuel for rocket aircraft. All the basic information on these, as they existed in Germany, is now in possession of the Army Air Forces. The exploitation conducted at these objectives indicated that the Germans were more advanced in rocket fuel and chemical supercharging than the AAF, but the material now in our possession is more than sufficient to supply the necessary intelligence on these subjects. A substantial portion of the information on production of aviation fuel and lubricants has already been made

available and is in the possession of U.S. agencies and corporations interested in this field.

(3) A document covering a complete source of instruction in the handling of plastic welding, a process which had been employed by the German aircraft industry, was located at Halle. This novel method of fabrication provided for the joining of plastics by flame gas welding and enabled the sections joined together to possess the same strength at juncture as the original material. This information was reported to the AAF for joint study with the Office of Scientific and Research Development.

(4) An acoustic-controlled guided missile research development program, together with operating personnel; was located at Bad Kissingen. The experimental control system developed there contained four electrical circuits that are activated by sound with the intended purpose of launching a rocket-propelled missile into the space occupied by a heavy bombardment formation, and constantly correcting the missile's course by means of incoming sound waves from the aircraft engines. The group of scientists who were engaged upon this development were detained in American custody at the laboratory to develop the program for Allied use.

(5) Athodyd (Lorin Engine) units that developed thrust in excess of 1500 kilograms were uncovered, and sufficient data was in our possession in May 1945 to permit immediate application in the field of high-speed aircraft. production.

(6) High-altitude engine test beds, the most elaborate in the world, which were capable of supplying refrigerated low-pressure air both for engine cooling and combustion, thus

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simulating atmospheric conditions at approximately 40,000 feet, were found at the BMW plant the largest German plant engaged
In manufacturing aircraft engines. The application of these
test beds for experiments, intended to assist 'our own manufacturers and thus improve
the of efficiency of our aircraft, was initiated at once.

(7) Complete information on the Freya and Reise "G" Wurtzburg and of the Jagdschloss radar equipment was uncovered at the research laboratory located at Koethen.

(8) After the Aerodynamic-Ballistics Research Station at Kochelsee was discovered about 15 May 1945, the Directorate of Intelligence, USAFE, assigned personnel to exploit fully this important target. Over one hundred and ninety German civilian research specialists under their original director, Dr. Herman, continued their work, the results of which, however, were turned over to us More than one hundred detailed reports concerning the station were prepared. The "Kochel Wind Tunnel" located there, had the largest testing sections and the greatest air flow of any known supersonic wind tunnel. It was considered by. Army Air Forces of such exceptional importance for research in connection with jet fighter and fighter bomber priority projects that the War Department directed that it be dismantled at once and shipped to the United States. Approximately twenty key German scientists, including Dr. Herman, the director, were removed to America to assist in the reassembling of the tunnel.

(9) Documents of all descriptions and nature were eventually discovered. The records of the German Patent Office, for instance, were found buried 1500 feet underground in a potash mine near Bacha. There were approximately 225,000 volumes, which included secret files. An attempt had been made to destroy them but the resulting explosions brought down a mass of debris which had served to smother the fire. Eventually, the files were evacuated and studied.

(10) Five hundred and eleven microfilm rolls of copies of records of the Oberkommando der Luftwaffe, which was the supreme air force command, were recovered from a mine near Hildesheim where they were hidden. They comprised, for the most part, records of the GAF personnel office, together with statistics on climate at GAF airdromes.

(11) The records of a department of the Speer Ministry, the German Ministry of Production, which dealt with the secret weapons program, particularly V-weapons, rockets and jets, was seized and evacuated through air channels, together with Dr. Rickhei, who was charged with the primary responsibility for the program.

(12) The GAF main equipment depots at Schwein and Kolleda were exploited. The former depot was found dispersed to 53

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sub-depots, and although a large proportion of the records was destroyed, sufficient documents were obtained to initiate studies into the GAF system. The Administrative and Quartermaster records of the GAF were recovered from hiding places near Berchtesgaden. The Flying Personnel records, included about 50,000 pilots' qualification cards, together with weather staff records, which were discovered in a swimming pool at Stradtroda. The pilots' cards are of particular value, from an intelligence viewpoint, for future control measures of German air force flying personnel.

(13) Practically the latest type of every German aircraft, some of which never saw combat, eventually were located intact, or a sufficient quantity-of available parts discovered for German mechanics to assemble a certain-type. Usually these were sent across Europe to France, where they were shipped to Wright Field. Occasionally some were flown back. At least one, in some cases as many as ten, of the following, which represent only a fraction of the types, were located, some only after extensive searching throughout Germany, and forwarded to the United States for extended study and development.

The Messerschmitt aircraft series 1101, 1106, 1110, 1111 and 1112, a series particularly interesting in that it illustrates a phase of coordinated aircraft design into which American aircraft is only now entering; seven rocket-propelled piloted aircraft specifically designed for anti-bomber interception work; a jet-propelled helicopter;

Flettner 282 helicopter;

Horton 9, a flying winged glider;

Ju 88, a radar equipped twin-engine night fighter;

Ju 290, four-engine long range transport;

seven Me 163s, rocket-propelled interceptor fighters;

ten Me 262s, twin jet-propelled fighter-interceptors;

HE-162, single place fighter powered by jet engines;

flying bombs, type V1 single and dual piloted;

Lippisch P-13 Jager, a tailless twin rocket-propelled wing for supersonic speeds;

designs and models of small rocket-propelled piloted aircraft created-for bomber interception work;

three sets of FX-1400, a radio controlled bomb,

and seven complete A-4 rockets (V2s).

Numerous types of aerial equipment and instruments of all models of latest designs were obtained and likewise quickly dispatched for evaluation and study. A specimen of the German secret weapon, the X-4 rocket-propelled, winged, flight-controlled anti-aircraft missile, intended for launching from fighter aircraft against United States heavy bombardment daylight formations, and the new anti-aircraft missile HS-117, which was launched from the ground, were found and sent to the British Air Ministry for examination.

However great in quantity and extensive in scope the captured equipment, documents, and records of industrial concerns and technical research laboratories were, greater still was the extensive scope of information and salient facts gathered from eminent German scientists, technicians and factory managers through personal interrogations. During the early phase of "OPERATION LUSTY", ATI teams and skilled American aeronautical engineers and scientists investigating intelligence targets

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carried out such detailed and extensive interrogations that a wealth of technical information of extreme importance was extricated from brilliant minds once directed to our own destruction. A typical team report submitted after a field trip, vividly illustrates the nature of such interrogations that took place. One team, composed of C. W. Chilson, representing Curtis Wright Company, and E. G. Haven and S. R. Puffer, from General Electric, prepared the following reports after an inspection of the BMW Company and interrogation of their key German personnel:

(a) Outline of Jet Propulsion Development Program Being Actively Followed in Germany.

(b) Outline of Entire Program of Non-Reciprocating Power. Plants Under Development in Germany.

(c) Metallurgical Data Used by BMW on Gas Turbines.

(d) Information on Gas Turbines for Propeller and Jets.

(e) Description of BMW .003 Jet Jumo, Together with the Rocket Assist for the Same Unit.

(f) Description of BMW 801 High Altitude Engine, with Turbo Supercharger and Automatic Control, Together with a Performance Report.

Interrogation reports flowed into the Directorate of Intelligence, USAFE, on such topics as Hollow Steel Jet Turbine Blades; Wind Tunnel Blades, Mica Substitutes, Ceramics, Lacquers, Cements, Buna Rubber, Rocket, Propellants (Fluid and Solid), German Aircraft Engine Types, Safety Fuels, Interferometer Measurements of Pressure Distribution of Wind Tunnel Models, Safety Fuels, Navy Torpedo Models, Temperature Controls on Me Planes, Electrical Controls on Me Planes, Production Design and Manufacturing, Technique Covering Hard Rubber Used in Aircraft Magneto's, Oxygen and Pressurized Cabin Control Equipment. Such reports were immediately prepared and forwarded to Washington for dissemination to various industrial concerns and laboratories for further study and development. Quite frequently it became necessary to keep in custody for extended periods groups of German scientists whose extensive information of the particular subjects precluded the possibility of obtaining for intelligence purposes in one or two interrogations the essence of their knowledge. For this reason, Albert Speer, Director of the German Ministry of Production, together with key members of his staff: Dr. Wurster, designer of the Great Enzin, a rocket-propelled guided missile capable of operating at 53,000 feet with speeds approximating the speed of sound; Professor Willi Messerschmitt; five technical research professors from Darmstadt Technische Hochschule; Dr. Alexander Lippisch, who had accomplished important work on aerodynamic designs and supersonic speed flying wings; Dr. Kurt Tank, President and Chief designer of Focke-Wulf; fifteen brilliant scientists and technicians of the Peenemunde Research Institute; and scores of others equally as proficient

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in their Individual scientific accomplishments, were indefinitely retained for interrogation purposes. When the nature of the work being carried out in German research laboratories was of such vital importance that its completion would materially assist the U. S. Government, moreover, either in the prosecution of the war or in protecting her interests against future aggression, it was found expedient and wise to allow the research professors and technicians to execute their work under American supervision. This was accomplished both in Germany itself and in America, where many scientists were quickly sent during the early summer of 1945. Certain technical objectives, such as The Hermann Goering Aeronautical Research Establishment, the Aerodynamic-Ballistics Research Station, the Aerodynamic Institute & Kaiser Wilhelm Institute, and the Bayerische Motoren Werke, were of such outstanding importance that investigation by specially chosen teams, over extended periods, will be required if everything about them is to be completely exploited.

To catalogue and file the thousands of tons of German documents that were rapidly being discovered throughout the country and then forwarded to one of the three collecting points, the Assistant Chief of Staff (A-2) USAFE, together with the Chief of Technical Intelligence Division, set up in London in June 1945, an Air Documents Research Center, which became the temporary repository for all German air documents. This Center was housed in a six-story building containing approximately 28,000 square feet of usable space. All air documents from the British and American occupation zones in Germany and Austria flowed to this Center. In three months time, alone, over 111,000 tons of such documents were flown from Germany to the Center for processing before being sent elsewhere to one or more agencies interested in the subject.

As the documents poured in, enlisted personnel with a good knowledge of the German language, separated them into technical and non-technical categories. All non-technical documents were then distributed to their proper agencies, while the technical documents received a detailed processing. Each was subsequently catalogued, examined, their worth assessed, and then filed or distributed according to their importance. To assist in the proper screening, it was necessary to prepare a technical German-English dictionary, and a cataloguer's handbook to bring up-to-date the U. S. Aeronautical Index. Two British agencies of the Air Ministry, A. D. I (K) and A.I.2(g), which were partially housed in the Center, not only met the responsibilities assigned to them by the Air Ministry, but materially assisted in the processing and cataloguing of documents. The U.S. Navy Bureau of Aeronautics also assisted in processing by supplying personnel, microfilm equipment and operators, and film-processing facilities, while twenty-five prominent American scientists and aeronautical engineers, such as Jean Piccard and Dr. John Akerman, University of Minnesota, Dr. Ernest Robischon, California Institute of

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Technology, Dr. Paul E. Hemke, Rensselaer Polytechnic Institute, and Dr. Richard Hartenberg, Northwestern University, acted in a consulting and advisory capacity. Individual unit libraries within the Center were set up to handle documentary material belonging to giant German concerns. Such libraries existed for the Messerschmitt Company, the ZBW, an organization which existed in Germany for the cooperation and dissemination of all formal technical aeronautical reports, the BMW, the Daimler-Benz, and others. Libraries, as well as sections, were set up to file documents of similar technical nature, such as Aircraft, Armament, Engines, Turbines and Propellers, Electronics, Rockets, Jets, and Guided Missiles. Once the documents were indexed and given a permanent library number, the laborious job of microfilming everything of importance, needed both in England and America, took place. The positive copies of the original microfilms were then sent to U. S. Army Air Forces, U.S. Navy, and British Agencies for further distribution. That which did not lend itself to reproduction by this method was either photographed, photostated, or blueprinted. Eventually, a German Technical Air Documents Card Index will be prepared and copies distributed throughout Great Britain and the United States to Using Agencies, which include the aeronautical industry, government agencies, research establishments and educational institutions. At present, there are two hundred of these using agencies in the United States alone that have already made extensive use of captured German technical information gathered originally by ATI teams—from industrial firms, research institutions, and universities in Germany.

Non-technical documents after leaving the Documents Center were delivered to a combined research agency of USAFE ,and Air Ministry known as "A.I.12/USAFE". This section was created in the fall of 1944 to meet the requirements of Post Hostilities planning staffs, and in anticipation of Air Intelligence requirements for the disarmament and demobilization of the German Air Force, as well as a comprehensive long range study of all phases

of the GAF. The library on the German Air Force that had slowly been built up by British specialists and American officers under the Directorate of Intelligence, USAFE, prior to "OPERATION LUSTY", became suddenly augmented to such an extent by quantities of documents located by ATI teams that the staff of officers and enlisted men had to be substantially increased. In spite of the tremendous work involved --- cataloguing, micro-filming, photo-stating, translating, and preparing detailed library lists and reports for dissemination to interested agencies --- the staff handled the work in a thorough and expeditious manner. By the time the first Air Force officers arrived from the United States in June to prepare staff studies on aspects of the German Air Force, practically all of the necessary material had been collected and catagorized so that work could immediately. commence.

Eventually, over two hundred officers, chosen, for the most part, by Hq Army Air Forces, from various air force commands

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in the United States, were engaged in scholarly research to fulfill their assigned requirements. Working from offices located in London and under the direction and guidance of the Assistant Chief of Staff A-2, USAFE, the officers exploited every available pertinent document located in repositories in London, A,I.12/USAFE, Air Documents Research Center, British and American Navy and Army libraries, and the British Museum. It was soon discovered, however, that in spite of the tremendous quantity and excellent quality of captured material available, too many questions remained unanswered and too many enigmas concerning various aspects of the enemy's air force unsolved. It became imperative, consequently, for field trips to be made into Germany in an attempt to fulfill the exact and comprehensive requirement's laid down, not only by Hq Army Air Forces, but by the staff officers themselves, who, through a desire to accomplish a superior research job and obtain for future-reference every iota of information relative to their enemy's strength, weakness, and ambitions of the past and future, refused to satisfy themselves with incomplete answers and results.

Officers preparing a study of German Air Defenses visited the Flak defenses at Bremen, Hamburg, Munster, Nuremberg, and Augsburg, interrogated General von Axthelm, Chief of German Air Force flak units, and his staff, as well as members of various flak organizations, such as the 8th Flak Division, and 8th Flak Brigade. A detailed study was made of the Air Force at Grove, Denmark, where a complete fighter defense installation was captured intact with plotting center and all-key personnel necessary for its operation. Similarly, officers preparing other staff studies made trips that took them as far south as Austria and as far north as Norway in their quest for the desired facts and figures, inspecting supply dumps, aerodromes, and other installations and interrogated appropriate German P/W officers located both in British and American zones.

Most of the detailed interrogations conducted by staff study offices were of members of the German Air Ministry Staff (OKL), which had been captured and held at Berchtesgaden as a combined USAFE/Air Ministry intelligence exploitation target, and of high ranking German army officers detained in P/W cages. When it became evident that many such interrogations would be necessary to fulfill the requirements, the OKL party was removed in toto to a camp close to London. Similarly, important German Ground Officers were likewise sent to England to further the project. Hundreds of detailed interrogations were conducted. To enumerate such German Officers interrogated would be comparable to listing a roster of the German Air Force. The following, most of whom were high ranking officers, is illustrative of the scope covered:

Reichsmarschall Goering.
Oberst von Brauchitsch, Goering's Aide.

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General der Flieger Koller, Chief of General Staff.
Major Hermann, Administrative Officer.
Oberst Wolter, General Koller's advisor.
General Maj. von Rohden, Historian of the GAF.
Min. Dir Dr. Benkendorf, Chief Meteorological Service.
General Martini, Signals.
General Lt. von Criegern, General Quartermaster.
Oberst Fritz Nebel, ZRadar Inspector.
General Maj. Hitschold, Chief Ground Attack Operations.
Generalleutnant Gallana, Chief Fighter Operations.
Generalleutnant von Massow, Gen. der Fliegerausbildung.
Gen. Oberstabsarzt Dr. Schroeder, Medical Services.
General Maj. Morzik, Luftransport Chef der Wehrmacht.
General Lt. Dahlmann, Flying Safety.

General Galland, a 33-year old flyer, who received his first battle experience in Spain and who has obtained a reputation among Allied officers as perhaps the most brilliant general in the German Air Force, prepared an historical narrative of fighter tactics employed for all campaigns, beginning with the Spanish and ending with the last concerted attacks against Allied fighters and bombers in 1945. This included, in part, a rather comprehensive history of the GAF. General von Rohden and his assistants, under the direction of the historical section, USAFE, prepared a lengthy dissertation on the history of the German theories of the application of air power. General Marzik and his assistants wrote up every airborne ' campaign the Germans had executed, or planned, such as the air invasions of Malta and England. Similarly, to satisfy the Post Hostilities requirements, German officers prepared detailed treatises on every topic intelligence officers wished discussed: medicine, training devices and procedures, weather, flak defenses, fighter defenses and attacks, . photo intelligence, provost marshal system, methods used to evade the Treaty of Versailles, methods used to indoctrinate Nazi principles in the Luftwaffe, and many others.

The first staff study prepared in compliance with the Air Force Post Hostilities Requirements was finished on. the 12 August 1945, the last on January 3, 1946. The list

of scholarly studies below, comprising forty-five thick volumes, includes, it is reasonable to state, far more information concerning the German Air Force than the Germans themselves had ever collected during the war:

Communications.
Aviation Medicine.
Flying Safety.
Inspection.
Provost Marshall.
Personnel Administration.
Supply.
Maintenance.
Patent Activities.

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Air Defense.
Propaganda in the Luftwaffe.
Records & Reports System, Statistical Controls & Planning Methods.
Tactical Employment:

Liaison Operations.
Troop Carrier Operations.
Tables of Organization and Equipment.
Coordination between the GAF Air and Ground Forces. Controlled Missile Program.
Night Fighter Operations.
Emergency Sea Rescue.
Fighter Tactics employed against Allied fighters, fighter bombers, and heavy bombardment formations.
Photo Intelligence.

Copies of these reports were given to the British Air Ministry and disseminated in America to every interested military command. They will eventually be studied in Staff and Command Schools and the War. College, and may serve as a nucleus for future historians interested in the aerial aspects of the second World War, or, in particular, of an air force once reputed to be the greatest and most efficient ever assembled. The military mistakes made by German Air Force generals, the clash of strong personalities that was so detrimental to their cause and purpose, the magnificent military plans created but never executed, tactics employed, principles of air power devised and used, adopted method of communications, supply, and training, are all lucidly and scholarly presented. In these documents lies the essence, so to speak, of a once sinister and destructive force now so hopelessly crushed that its rebirth appears highly improbable.

"OPERATION LUSTY" is now dead. No longer do ATI teams scour the German countryside exploiting intelligence targets. This work has been completed. The requirements, both technical and non-technical, have been fulfilled: equipment and documents of immediate interest and value to technical research centers in the United States for evaluation and immediate execution towards the war against Japan was expeditiously collected in the early weeks of the project's existence; Air Staff Post Hostilities Intelligence Requirements were fulfilled; equipment and documents were sent to technical research centers for

extended periods of study and development to increase the efficiency of United States aircraft, equipment, and research establishments. There still exists however, strict supervision of eminent German scientists and their assistants, and corporation directors and managers, technical workers, and university professors, who were once employed in scientific research. Many of such personnel are still actively engaged both in the United States

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and Germany in the furthering of inventions, technical discoveries and formulation of new scientific processes that they were doing directly or indirectly for the German government when hostilities ceased. Certain important corporations such as those previously mentioned, moreover, are still working though the war had never ended; the results of their labors, however, now benefit the United States rather than Germany. If necessary and advantageous, this aspect of exploitation will continue indefinitely. The results that have already been obtained and those that are certain to appear in the immediate future, compensate over and again for the time, effort, and money expended in extricating from the brains of brilliant German scientists every particle of information and knowledge they possess that in any way further the interests of our government.

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Additional Information

OPERATION "LUSTY" (LUftwaffe Secret Technology)

During WWII, the U.S. Army Air Forces (USAAF) Intelligence Service sent teams to Europe to gain access to enemy aircraft, technical and scientific reports, research facilities, and weapons for study in the U.S. The Air Technical Intelligence (ATI) teams, trained at the Technical Intelligence School at Wright Field, Ohio, collected enemy equipment to learn about Germany's technical developments. The ATI teams competed with 32 allied technical intelligence groups to gain information and equipment recovered from crash sites. As the war concluded, the various intelligence teams, including the ATI, shifted from tactical intelligence to post hostilities investigations. Exploitation intelligence increased dramatically.

On April 22, 1945, the USAAF combined technical and post-hostilities intelligence objectives under the Exploitation Division with the code name LUSTY. Operation LUSTY began with the aim of exploiting captured German scientific documents, research facilities, and aircraft. The Operation had two teams. One, under the leadership of Colonel Harold E. Watson, a former Wright Field test pilot, collected enemy aircraft and weapons for further examination in the U.S. The other recruited scientists, collected documents, and investigated facilities. Having been part of ATI in 1944, Colonel Watson eagerly accepted the Operation LUSTY assignment.

WATSON'S "WHIZZERS"



Col. Harold E. Watson

In 1944, intelligence experts at Wright Field had developed lists of advanced aviation equipment they wanted to examine. Colonel Watson and his crew, nicknamed "Watson's Whizzers," comprised of pilots, engineers, and maintenance men, used these "Black Lists" to collect aircraft. He organized his "Whizzers" into two sections: one collected jet aircraft and the other procured piston engine aircraft and non-flyable jet and rocket equipment.

After the war, the "Whizzers" added Luftwaffe test pilots to their team. One was Hauptman Heinz Braur. On May 8, 1945, Braur flew 70 women, children, and wounded troops to Munich-Riem airport. After he landed, Braur was approached by one of Watson's men who gave him the choice of either going to a prison camp or flying with the "Whizzers." Braur thought flying more preferable. Three Messerschmitt employees also joined the "Whizzers:" Karl Baur, the Chief Test Pilot of Experimental Aircraft; test pilot Ludwig "Willie" Huffman; and engineering superintendent, Gerhard Coulis. Test pilot Herman Kersting joined later. When the "Whizzers" located nine Me 262 jet aircraft at Lechfeld airfield, these German test pilots had the expertise to fly them.

Watson's men traveled far and wide over Europe by jeep and occasionally by air to find the aircraft on the "Black Lists." Once found, they had to be shipped to the U.S. Fortunately, the British were willing to loan the aircraft carrier HMS Reaper. The most viable harbor for docking the carrier and loading the various aircraft was at Cherbourg, France. The "Whizzers" flew the Me 262s and other aircraft from Lechfeld to St. Dizier, to Melun, and then to Cherbourg. All the aircraft were cocooned against the salt air and weather, loaded onto the carrier, and brought to the U.S. where they were studied by the Air Intelligence groups of both the USAAF and Navy.

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German ME-163B Komet

DISPOSITION OF FOREIGN EQUIPMENT

In 1945, the enemy aircraft shipped to the US were divided between the Navy and the Army Air Forces. General Hap Arnold ordered the preservation of one of every type of aircraft used by the enemy forces. The Air Force brought their aircraft to Wright Field, and when the field could no longer handle additional aircraft, many were sent to **Freeman Field, Seymour, Indiana**. In the end, Operation LUSTY collectors had acquired 16,280 items (6,200 tons) to be examined by intelligence personnel who selected 2,398 separate items for technical analysis. Forty-seven personnel were engaged in the identification, inspection, and warehousing of captured foreign equipment.



German Bachem BP-20 Natter

In 1946, when **Freeman Field** was scheduled to close, Air Technical Service Command (ATSC) had to move the aircraft. The larger aircraft were sent to Davis-Monthan Field, Tucson, Arizona, and the fighter aircraft sent to the Special Depot, Park Ridge, Illinois (now O'Hare airport) which was under the control of ATSC's Office of Intelligence. The Special Depot occupied buildings that Douglas Airplane Company had used to build C-54 aircraft.

The aircraft were stored in these two locations until they could be disposed of in accordance with General Arnold's order.

With the start of the Korean War in 1950, the Air Force needed the Special Depot; so the aircraft had to be moved outside. In 1953, some of the aircraft were moved to the National Air and Space Museum in Silver Hill, Maryland, and the remaining aircraft were scrapped.



Col. Harold E. Watson



German ME-163B Komet



German Bachem BP-20 Natter