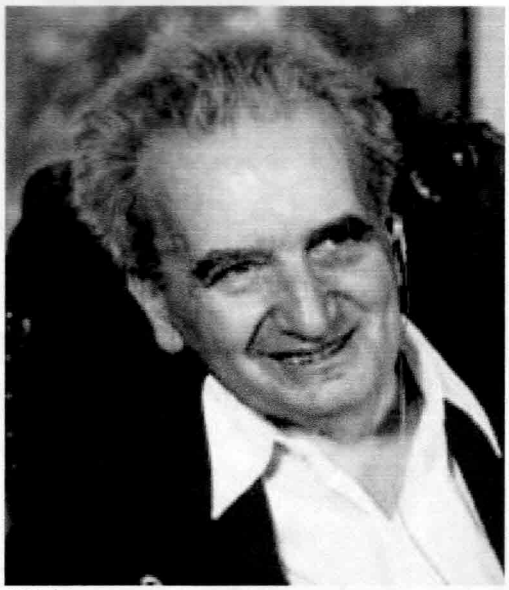
Operation LUSTY

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

DIK ALAN DASO, PHD

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.



USAF photo

Caltech professor Theodore von Kármán, the "dean of American aeronautics"

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, ex-

USAAF photo

Dr. Kármán (right) wears the uniform of an Army Air Forces colonel (sans eagles) during Operation LUSTY.

ploding 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, weapons, 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 vi-

sion."[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.

USAAF photo

A camouflaged German aeronautics laboratory seen from the air

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 "Tooey" 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.

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Caches of technical documents were hidden, along with assembly locations for V-1 and V-2 rockets, in underground tunnels such as this one.

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 antiaircraft 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]

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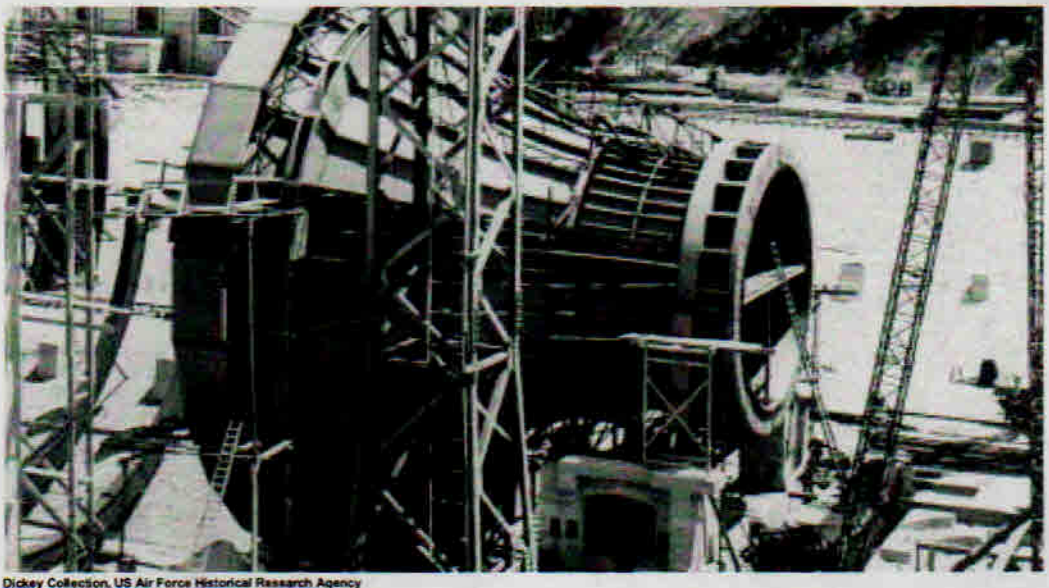
Rocket construction was well advanced, and test equipment was a frequent find. This Feuerlilie was not even completely assembled.

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

Dickey Collection, US Air Force Historical Research Agency

This autorotator variant used a jet engine for propulsion. Exhaust was expelled and ignited through the tips of the helicopter rotors (insert).



Dickey Collection, US Air Force Historical Research Agency

Enormous wind tunnels like this one, under construction, housed advanced aeronautics facilities.

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 "practi-

Dickey Collection, US Air Force Historical Research Agency

Still hanging in the wind-tunnel test sections were advanced wing designs—most notably, "swept-back" wings that would increase speed and maneuverability.

Dickey Collection, US Air Force Historical Research Agency

cal 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.

USAF photo

In June 1946, the secret Scientific Advisory Group met officially as the Scientific Advisory Board, an organization that still exists. Kármán (at the head of the table) ran the show until the mid-1950s.

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.

General Arnold looking skyward at soaring AAF aircraft

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 vish 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