TWO PROPELLERS SHORT OF A PLANE:

The American Introduction of Gliders Into Combat in Sicily, 1943

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Acquisition professionals have much to gain from studying the past. We are busy with programs valued at millions or billions of dollars and are concerned about executing them successfully. Defense acquisition has played an important role in 20th Century American history.

The most dramatic transformations in the American political economy have occurred during wars. The military plays a significant role in mobilizing the nation's resources for war and, in the cases of the two world wars, no sector of the economy escaped government interference.

As we fulfill our responsibilities in peacetime, we should understand the actual and potential consequences of our actions. Studying myriad ways the government and, more specifically the military, injected itself into the American economy is a daunting task, especially if one considers America in the 1900s. My goal is more limited. This article provides an example of the importance of ideas in military and economic affairs by using a case study from World War II (WW II).

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1941-1945

Technological innovation lies at the heart of defense acquisition, and ideas and beliefs about the nature of warfare properly influence acquisition decisions. The development and use of military gliders between 1941 and 1945 illustrate this point.

From their first use in combat during the invasion of Sicily in July 1943 to the end of the war, gliders promised much but delivered little. An analysis of their implementation underscores interaction between the home front

The Northwestern XPG-2A, a CG-4 with engines.

Photos from Special Collections Branch, USAF Academy Library.

and battle front, the military and industry.[1] It focuses on the process of technological innovation and the key role ideology plays in the process. As a military weapon, the glider failed in WW II largely because American airmen adhered to a strategic bombing doctrine for which the glider played no major role.

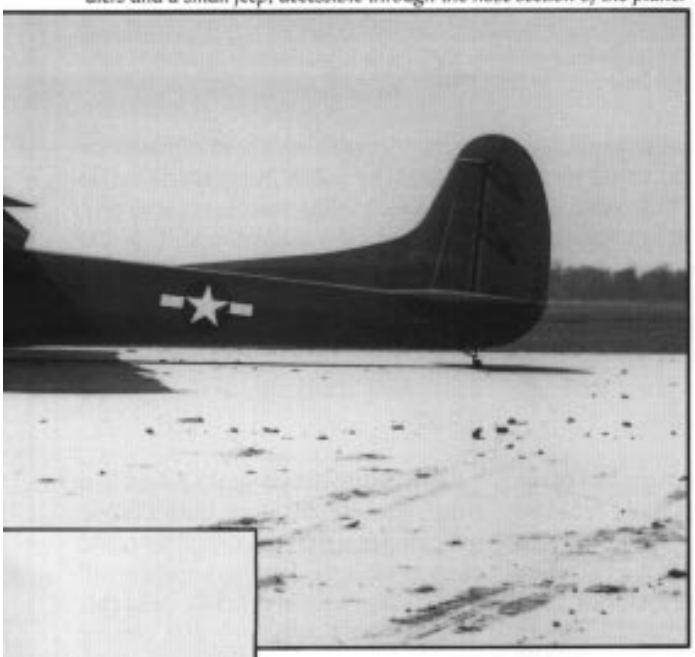
Innovation/Ideology

At this point, innovation and ideology deserve explanation. A definition of innovation can be straightforward; in the simplest terms, it is anything new to an organization. It does not have to be something original outside the organization — brand-new creations are not necessary for innovation to occur.[2]

This is an important point. Military gliders existed in the German and British air forces by 1939. The U.S. Army Air Forces (AAF) had not considered them seriously until 1940. But shortly thereafter, many organizations within the U.S. Army began simultaneous efforts to employ the military glider technology.

Prevailing ideology powerfully influences the hundreds of decisions the innovation process demands. An ideology orients an organization with respect to its past and its vision of the future.[3] This shared definition of the organization and what it will be guides decision making and is reflected in planning and execution of plans. It has obvious implications for innovation, as the American introduction of gliders into combat in Sicily clearly reveals.

The CG-4 glider, nicknamed "Hodrian," carried 15 fully equipped soldiers and a small jeep, accessible through the nose section of the plane.



The main actors in this story of technological innovation were the Army Air Corps, renamed the AAF on June 20, 1941, and the Waco Aircraft Company of Troy, Ohio. Both had visions of the future which grew from their interwar experiences, and both had set plans reflecting these presumptions.

For the AAF, strategic bombing doctrine served as an ideology and shaped airmen's notions of innovation. Likewise, Company President Clayton J. Brukner communicated his vision for the future and developed plans to ensure viability of his company. These plans set Waco on a path intersecting the AAF road toward mobilization — and independence.

The Ultimate Weapon

The AAF entered the industrial mobilization game late, despite the fact that aviation had captured the imagination of some Army officers and the American public during World War I (WW I). In the minds of some, after the war the expectation grew that planes could serve as the ultimate weapon. As a result of theoretical studies at Maxwell Field, Ala., airmen ultimately claimed that high altitude, daylight and precision bombing of an enemy's economic infrastructure would single-handedly win future wars.[4]

As air leaders of this opinion dominated the AAF, they were able to direct the little money received during the depression toward their vision. Continued technological advances fueled the public's and airmen's enthusiasm for air power. For some, this promised an alternative to the holocaust of WW I.[5] In order to turn these visions into reality, airmen pursued aeronautical innovations which supported their evolving conception of war. The best example of this ideologically focused research was the Boeing B-17 heavy bomber.

According to its most ardent supporters, the B-17 had the range and payload which would, with sufficient numbers, bring an enemy to its knees quickly. With doctrinal and technological issues settled, airmen addressed the neglected problem of industrial mobilization.

The Strategic Bombing Doctrine

As war approached in the aftermath of the September 1938 Munich Crisis, the biggest problem was to acquire enough B-17s and other heavy bombers to implement the strategic bombing doctrine. This would take all the manufacturing capability of the major aircraft companies and leave them unable to produce anything else. General Henry H. "Hap" Arnold, Commanding General of the AAF, knew he had to find more manufacturing capacity. He pointed out:

> ...some of the airplane companies such as Waco, Ryan, Stinson, Beech Aircraft Corporation, Spartan and possibly oth-

ers who are now building commercial airplanes have had sufficient airplane manufacturing experience to qualify them for the manufacture, in time of emergency, of the primary training and basic training types....If the burden on the peace time military airplane industry can be lightened in this manner, increased experienced capacity will be available for the emergency requirements in military combat types.[6]

Only two months previously, Brukner volunteered Waco for defense contracting and now was waiting for the orders to arrive.[7] Not surprisingly, Colonel A. W. Robins' more detailed planning premises included elements of this guidance. For example, first on his list of priorities was "[a]ssigning Army types and models to respective current manufacturers."[8] By the summer of 1941, defense contractors were approaching capacity, and Waco's turn was near. When the company won its largest defense contract, the result was the birth of the military glider program.

Recommended changes in the CG-4 resulted in the XCG-15 in 1944, with a wingspan 21 feet less than the CG-4A. It could land on a shorter runway.

Glider Program

Arnold's decision to initiate the glider program derived from developments overseas. The Soviet Union and Germany had experimented with gliders before the outbreak of war in 1939. American airmen knew this but showed no interest in this unique aeronautical capability.[9] In some measure, this was due to their focus on strategic bombing. Gliders, after all, were a tactical weapon and had ties to the Army. Such an auxiliary use of air power detracted from the strategic mission airmen were trying to accomplish. Auxiliary aviation had found a more receptive audience in the German military.

The *Luftwaffe* embraced the idea of marrying air power with ground forces and put the glider to effective use in the Low Countries in 1940 and Crete in 1941. Arnold knew the American air force had no similar capability. Despite the glider's doctrinal incongruity in the AAF, he ordered Wright Field to introduce the innovation as soon as possible. With such high priority and little guidance, the AAF struggled to define what a military glider actually was. The plans to achieve the general's goals were understandably confused.

Thus, the sudden emergence of the glider program in June 1941 required drastic actions. The need for a new kind of pilot meant that the Secretary of War had to countermand a 1932 order prohibiting Army personnel from flying in a glider.[10] Since peacetime military contractors were fully engaged in mobilization, procurement officials had to establish relationships with companies about which they knew little. But, the heightened importance of gliders could not shake the priorities airmen had established through the years, nor did it overturn existing plans.

Constraints on Program

These new ties with business, for example, were to conform to the AAF scheme for mobilization. Constraints on the glider program included no interference with ongoing military contracts, designs which minimized or avoided the use of any materials also employed in the strategic bomber program, and a much lower priority rating for materials that met a need elsewhere in the mobilization program.[11] Less than 12 months after development started, these conditions jeopardized Arnold's desire to field gliders quickly.

As a result, the program got off to a rough start. Intelligence from Europe indicated that the German glider could carry 15 equipped soldiers and a small truck. Wright Field officials used this to guide the companies that offered specific proposals to the military for the glider. With no American experience from which to draw, the German information, though sketchy, was a start.

Attempts to have Soviet documents translated into English offered early evidence that the glider problem would be tough to solve. Intelligence analysts told Wright Field that the Russian translators were too busy with higher-priority projects.[12] The technical requirements for the American military glider evolved slowly as the senior leadership struggled to determine its combat role.

Sixteen Contractors

Initially, the Air Force chose 16 contractors to manufacture CG-4 gliders. Waco produced the design and was primary engineering contractor, and also a major manufacturer of the glider. If Waco had been in the second tier of companies the AAF considered during mobilization, then these companies Waco worked with were even further outside parameters the AAF set for consideration.

Included in this group were newcomers to the aviation business like the Babcock Aircraft and Robertson Aircraft companies. Another new arrival was Ford, as it converted its vast production facilities to the aviation program. Included were more recognizable aviation names, most notably the Cessna Company. Engaged in other aspects of mobilization, Cessna was tagged by AAF as one of the most competent companies in the glider program. But Waco had to deal with other firms new to mass production and defense contracting, the most outstanding example being the Ward Furniture Company. Many of these disparate producers asked for, and were usually granted, Army permission to deviate from the master design when compliance meant a longer delivery schedule.[13] Brukner faced a difficult task in coordinating this diverse collection of producers, and drew empathy of officials at Wright Field. One wrote, "Poor old Waco doesn't do anything else but interview firemen who want to build gliders."[14]

The CG-4 Glider

The CG-4 glider, nicknamed the "Hadrian," saw the most combat action during the war. The nose section opened vertically upward (similar to today's C-5 aircraft), thus allowing rapid on- and off-loading of men and equipment—if the glider landed intact.

Through a series of experiments, the AAF determined that the Douglas C-47 cargo plane made the best tug, towing up to three gliders simultaneously. During the war, other cargo aircraft, bombers and even fighters towed gliders on occasion; but, the C-47s did the bulk of the work. The CG-4 won no contests for beauty or gracefulness, but it could carry 15 fully-equipped soldiers and a light jeep, a significant load of combat power.

Further complicating the difficult manufacturing program was the AAF's continuing ambivalence. The only constant in the program was its urgency. Commanders debated concerning types and quantities of aircraft; they tinkered with the pilot training program to the extent that, even when gliders were ready for the front, the AAF had no pilots to fly them.

Difficult Innovation

Typical of these dealings was a February 1942 meeting among officers from Army organizations with a stake in the glider program. The person from headquarters in Washington said designs were too costly and bulky —gliders should take up less room on the transport ships than presently planned. Moreover, he added that Arnold wanted gliders which withstood only one use; the aircraft should essentially be disposable.

The Wright Field representatives countered that safety requirements called for the current approach and anything less substantial would jeopardize aircrews, passengers and cargo. The Troop Carrier Command, which would actually use the aircraft, was openly hostile to the whole idea and seemed reluctant to get involved.[15] Such confused inputs made technological innovation extremely difficult.

All program problems, while discernible on the home front, were fully realized only on the battlefront. From early May until July 1943, the gliders were poised in North Africa for the impending invasion of Sicily. One observer, Lieutenant Rolland Fetters, traveled through the various echelons in this theater just before the invasion.

Serving as an aide to the Special Assistant to the Secretary of War for Air, Mr. Richard DuPont, Fetters witnessed introduction of this new technology to warfare. His incredibly rich report from this trip revealed the deplorable treatment the glider faced in Africa. It revealed the ultimate consequences this innovation met in the face of an unsupportive ideology.

Levels of Command

Fetters noted different perceptions about gliders at the various command levels. Generals gloated about their units' abilities to field and maintain the new aircraft. The majors and captains at the depot level commented on the lack of parts and tools needed to assemble gliders.

Finally, Fetters met soldiers responsible for actually doing the work and was appalled by the working conditions and products turned out. At one base, he found only eight serviceable gliders out of 28 he inspected, and they needed significant work to be airworthy. Gliders arrived with parts kits missing and in unmarked crates. When the aircraft sections were located, crews found assembly impossible because the Ford fuselage did not match the Waco wings which did not match the Cessna empennage, etc. The gliders themselves demanded that maintainers show initiative, creativity and resourcefulness.

Soldiers instead impressed the lieutenant with their apathy, but he was not surprised given the low priority assigned to their task. All units were undermanned, poorly trained, and underequipped. Fetters wrote that "nothing will improve until we outfit these units and treat the men as we should."[16]

Fetters encountered a reality very different than the picture painted for him at higher headquarters. Those offices, however, were preparing plans for the Allied invasion of Sicily. Those plans reflected the reality air commanders perceived and their prevail-

Over 2000 C-130 Hercules transports have been built, making C-130s the longest production run, more than 35 years, of any military transport.

ing ideology of warfare. Above all, the drive for air force independence influenced air leaders. Even though the effort was to be a joint operation, employing sea, ground and air forces, the airmen stuck to their narrower outlook.

The British Style

The British, partners in this invasion, supplied the overall air commander, Sir Arthur Tedder, who was adamant that the air force remain unfettered by ground and naval planning and operations. Ground and naval commanders, however, reasonably asked to know how much air support to expect over the landing zones. Wing Commander Leslie Scarman, Tedder's personal assistant, said no answer was forthcoming. Scarman wrote, "His attitude then, as always, was 'Tell me what you want done and I will deliver in my own style.'"

Powerfully reinforced by their ally, American flyers continued to place a low priority on gliders. Their overriding concern about independence and the bombing missions in support of the invasion produced a skepticism about operation LADBROKE (the glider assault) and caused foot-dragging and delays in planning air routes for the mission. The airmen's intransigence irked General George S. Patton who asked the naval commander to provide air cover. He fumed, "[y]ou can get your Navy planes to do anything you want, but we can't get the Air Force to do a [expletive deleted] thing!"[17]

Plans called for the British to supply glider pilots while the Americans would pilot the cargo aircraft, the C-47, which served as the tug. The British had used gliders previously in the North African campaign, so many pilots had combat experience. What they lacked was flying time in the CG-4. The rushed but very recent delivery of gliders from the United States to Africa, combined with the logistics problems in the theater, resulted in RAF pilots with only two hours behind the controls of the CG-4 before flying into combat.[18]

A Challenging Task

The AAF C-47 pilots faced the challenging task of towing the gliders from Africa to Sicily at night, getting the aircraft into the proper position to release the glider, then returning home — a 10-hour mission. Of course the Axis powers tried to stop the Allies with antiaircraft artillery, and the weather could further complicate affairs. Pilots carried much anxiety with them on this mission, but they also carried their notions of the gliders' usefulness in combat.

The evening of the planned invasion, July 9, 1943, General Dwight D. Eisenhower agonized about the decision to launch the aircraft in the face of the gale that was blowing in the Mediterranean. Realizing that scrubbing the missions would mean a month's delay until the moon would again cast enough light, Eisenhower gambled that the planes would get through. The rough weather heightened complexity of the pilots' tasks. With so many inexperienced people at the controls, chaos reigned. Tugs got lost and returned to Africa. One released its glider over Malta — half way to Sicily and Eisenhower's command post. Most arrived near Sicily but when the Germans opened fire on the aircraft, many C-47s immediately released their gliders.[19] Those that continued had difficulty finding the drop zone and simply guessed where to release the gliders. All problems of the C-47 aircrews suddenly became the glider crews' dilemmas.

In the darkness, over unfamiliar territory, the glider aircrews had no control over their rate of descent and very little over their landing site. Many, unfortunately, landed in the sea, and the Waco quickly sank up to the wing panels. With no escape hatches built for the airmen and soldiers, hundreds of men lost their lives in the Mediterranean. Those landing on Sicily could do little more than hope for a mild crash. Gliders that smashed into trees and had wings ripped off, but otherwise remained intact, were common. Some ran over rock walls which ruined the aircraft but not the men and equipment inside.

Mission Failed

Others were not so lucky. Some gliders crashed before slowing significantly, and many soldiers never faced the enemy. In short, most of the glider invasion force landed more than five miles from the drop zone. In the bad weather and confusion of combat, the Allies lost or killed most of their own troops.[20] A glider assault on Sicily would have been difficult under ideal conditions. On July 9, 1943, the mission failed.

Cargo assault aircraft C-123 used in the Korean conflict. Shown here is a C-123 on a spraying mission in 1976.

Historians have debated the use of glider and airborne troops during the invasion of Sicily. John Keegan, for example, in his acclaimed *The Second World War*, assesses airborne operations in general, including gliders, in this summation:

> There is a possibility that a combination of luck and judgement will deposit him [the airborne soldier] and his comrades beyond the jaws of danger, enable them to assemble and allow formed airborne units to go forward to battle; but the probability is otherwise.

Surprisingly, and with little evidence, Keegan claims that Sicily and Normandy were the only examples which "evade[d] the probabilities." Carlo D'Este counters Keegan's evaluation of Sicily, but seconds his evaluation of airborne and glider operations. Sicily failed, he argues, because commanders did not take into account the difficult terrain and the relatively untested airborne tactics. He believes they were focused instead on inter-Service rivalries and on planning operations which emphasized the strength of each Service. My thesis holds that gliders offered no comparative advantage to the airmen in this inter-Service struggle, and the difficulties on the home front revealed their ambivalent attitudes toward this new technology. Like D'Este, I think combat operations in Sicily proved the glider failed, and I think Keegan outlines the specific problems airmen failed to overcome. Our opinions and debates can contribute to policy making today, but contemporary assessments seemed clear.

American airmen quickly offered their assessment. One C-47 pilot said he "would rather not have anything to do with these parasites." Another said that his "main objection other than the glider being a pile of junk, was the decrease in flying speed of the tug ship, with the glider in tow." The pilots volunteered to Lieutenant Fetters a solution to the maintenance nightmare the gliders caused: "The hell with the maintenance, we don't want to tow them around anyway."[21]

After many days in Africa and Sicily and many animated conversations with the troops, Fetters concluded the report to his commanding general with the grim observation that "[i]n general, the personnel in the North African Theater have little care or concern for gliders."[22]

The AAF tried to address problems with glider technology in the months after the assault. Specific recommendations for CG-4 improvements ranged from better cockpit instrumentation to escape hatches. In fact, changes became so substantial that, instead of designing a CG-4B (an updated version of the basic model), Wright Field asked Waco to design the CG-15, a much more capable aircraft.[23]

Glider Pilot Training

The glider pilot training program began graduating Americans fully qualified to fly in combat, and production problems diminished. But gliders were far from finding a home in the AAF. General officers regularly called for smaller production quantities or outright cancellation of the program.

Increased battlefield effectiveness failed to squelch the critics. Most indicative of the enduring strength of the Air Force drive for independence was the call at the end of the war for gliders with engines, thus eliminating the need for a tug. All along the glider necessitated cooperation with ground forces which airmen found uncomfortable. This proposal allowed airplanes to be airplanes. The oxymoron — multi-engined glider — was the AAF's most succinct commentary on glider technology.

Many officers and companies, including Waco, worked diligently in 1945 to solve the problem, but top air leaders knew these steps were part of an awkward transition to cargo assault aircraft, like the C-123 of the Korean Conflict and the C-130 of today.[24] Once all parties recognized the absurdity of "powered gliders," cargo gliders and the niche they were intended to fill left military minds until Vietnam. Then, the importance of inserting men and material at the battlefront while maintaining the element of surprise compelled the Army to develop and procure its own air force built around the aeronautical technology of the helicopter.

The glider, an example of failed innovation, revealed how encompassing the technological innovation process was. The introduction of gliders

into combat required actions from military officials in Washington, D.C., at Wright Field, in North Africa and Sicily. It touched firms in the aviation industry and impacted civilian agencies which administered the mobilization. In short, it demanded manufacturing, administrative and organizational innovations in the military and in business.

Frustrations

This complexity is familiar to acquisition professionals today. Some may find comfort in learning that our experiences and, perhaps, frustrations are not new. Others may express disappointment that some things never change. In this instance, the program suffered because the logic of this technology and its mission countered prevailing Air Force doctrine.

Ideas matter. Discerning the most important ideas from the crush of issues we deal with in acquisition is difficult. Placing our efforts in an appropriate historical context will help leaders at all levels communicate priorities more clearly and improve chances for successful technological innovation.

Endnotes

1. Many good histories take this kind of broad approach to the study of World War II. See for instance R. J. Overy, *The Air War*, 1938-1945 (New York: Stein and Day, 1981) and Michael S. Sherry, *The Rise of American Air Power* (New Haven: Yale University Press, 1987), both of which are noteworthy for their consideration of the political and economic dimensions of American air power. Studies focusing more on economic issues include Irving B. Holley, Jr., *Buying Aircraft: Materiel Procurement for the Army Air Forces* (Washington, D.C.: GPO, 1964), Harold G. Vatter, *The U. S. Economy in World War II* (New York: Columbia University Press, 1985); and R. Elberton Smith, *The Army and Economic Mobilization* (Washington, D.C.: GPO, 1991, reprint). My study contributes to this literature by examining the effects of the powerful political and economic forces on a particular technology which failed. Most histories have emphasized the successes in the mobilization story.

2. I have borrowed this broad interpretation of innovation from Louis Galambos, "The Innovative Organization: Viewed from the Shoulders of Schumpeter, Chandler, Lazonick, et al.," *Business and Economic History*, Vol. 22, No. 1, Fall 1993, p. 84.

3. Howard G. Jones III, "A New Rival: The Rise of the American Air Force," *Air Power History*, Winter 1991, p. 28.

4. For good treatments of the emergence of strategic bombing see Frank Futrell, *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force*, 1907-1964 (Maxwell Air Force Base, Ala.: Air University Press, 1971); Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941* (Washington, D.C.: GPO, 1955); and Lee Kennett, *A History of Strategic Bombing* (New York: Scribner's, 1982).

5. Aviation permeated many aspects of American culture. Studies exploring its influence include Sherry, *The Rise of American Air Power*; Joseph J. Corn, *The Winged Gospel: America's Romance with Aviation, 1900-1950* (New York: Oxford University Press, 1983); and William M. Leary, ed., *Aviation's Golden Age: Portraits from the 1920s and 1930s* (Iowa City: University of Iowa Press, 1989).

6. Major General H. H. Arnold to Chief, Materiel Division, January 9, 1939. Air Force Materiel Command Archives, Wright-Patterson AFB, Ohio.

7. Clayton J. Brukner to Major General H. H. Arnold, October 15, 1938. "War Department, 1930-1941," Clayton J. Brukner Papers, Wright State University Archives (WSUA), Dayton, Ohio.

8. Colonel A. W. Robins to Major General H. H. Arnold, January 31, 1939. AFMCA.

9. Paul M. Davis and Amy C. Fenwick, *Development of Gliders in the AAF* (Air Technical Service Command History Office, Study #216, May 1945, pp. 3-5.

10. Memorandum, Secretary of War, June 5, 1941. "Correspondence, 1941-1947," William C. Lazarus Papers, U.S. Air Force Academy Library Special Collections (USAFA Spec. Col.), Colorado Springs, Colo.

11. Interoffice Memorandum, February 7, 1942. "Correspondence, 1941-1947," Lazarus Papers, USAFA Spec. Col.

12. Memorandum, August 25, 1941. "Correspondence, 1941-1947," Lazarus Papers, USAFA Spec. Col.

13. Davis and Fenwick, p. 197.

14. Colonel F. O. Carroll quoted in *ibid.*, p. 107.

15. Meeting Minutes, February 16, 1942. "Correspondence, 1941-1947," Lazarus Papers, USAFA Spec. Col.

16. First Lieutenant Rolland F. Fetters, "Overseas Assignment for the Investigation of Army Air Forces Glider Program in European Theater of Operations," AFMCA.

17. Carlo D'Este, *Bitter Victory: The Battle for Sicily, 1943* (New York: E. P. Dutton, 1988), pp. 167-9.

18. For accounts of the planning efforts and the assault on Sicily, I relied on D'Este, *Bitter Victory*; William R. Breuer, *Drop Zone Sicily: Allied Airborne Strike, July 1943* (Novato, Calif.: Presidio Press, 1983); and Wesley F. Craven and James L. Cate, *The Army Air Forces in World War II*, Vol. 2. *Europe: Torch to Pointblank, August 1942 to December 1943* (Washington, D.C.: GPO, 1983).

19. Breuer, p. 42.

20. *Ibid.*, p. 45; D'Este, pp.231-2.

21. Fetters, "Overseas Assignment," *Daily Diary*, July 11, 1943, AFMCA, p. 11.

22. *Ibid*, Report to Commanding General, Headquarters Air Service Command, AFMCA, p. 3.

23. Davis and Fenwick, p. 176.

24. Raymond J. Snodgrass, *The AAF Glider Program, November 1944 to January 1947* (Air Materiel Command History Office, Intelligence Department, Study #217, 1947) pp. 54-5.