THE AIRBORNE AND SPECIAL OPERATIONS TEST BOARD

1940 - 1990

A COMMEMORATIVE HISTORY

TEST AND EXPERIMENTATION COMMAND

HISTORICAL OFFICE

FORT HOOD, TEXAS

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A COMMEMORATIVE HISTORY

By Robert L. Johnson II

Test and Experimentation Command

Historical Office

Fort Hood, Texas

October 1990

Personnel airdrop using the T-10B Parachute. (*Airborne and Special Operations Test Board*)

DEPARTMENT OF THE ARMY
TEXCOM AIRBORNE AND SPECIAL OPERATIONS TEST BOARD
FORT BRAGG, N.C. 28307-5000

REPLY TO
ATTENTION OF:

FOREWARD

The following history of the Test and Experimentation (TEXCOM) Airborne and Special Operations Test Board is a commemorative project for the 50th Anniversary of the United States Airborne (1940-1990).

The development of airborne equipment and procedures for airdrop delivery would not have been possible without the valuable contributions of the Airborne Board throughout its history. Therefore, this history is dedicated to the many enlisted, officer and civilian employees who provided their expertise throughout the past fifty years to this endeavor.

The Airborne Board began as a service board activated in December 1944 at Camp Mackall, North Carolina. Its history can be traced back through the Testing and Developing Section of the Airborne Command, organized in 1942, at Camp MacKall, North Carolina, to the original Parachute Test Platoon, activated at Fort Benning, Georgia, in June 1940. Following the end of World War II, on 30 September 1945, the Airborne Board was deactivated and incorporated into Army Ground Forces Board Number One on 1 October 1945.

Although the Airborne and Special Operations Test Board has operated under various designations over the last fifty years, the mission has remained the same; test and evaluate airdrop procedures for paratroopers and their equipment. As a tenant unit on Fort Bragg, the Board has and will continue to provide dynamic, responsive and quality testing in order to meet the needs of the airborne community. The Army Airborne and Special Operations Test Board is working hard, as part of the Army's test and evaluation team to enhance combat readiness and deployability of the soldiers of the airborne and special operations contingency forces.

Fred J. Hillyard
Colonel, United States Army
President, Airborne and Special
Operations Test Board

EDITOR'S FORWARD

Technological strategy offers us one of the most interesting challenges that we have ever known. This is a technological age and the mastery of technology will determine our fate in the future. It is absolutely fundamental that we understand technology, and the war of technology, and plan carefully for participation in this kind of war if we are to survive.

Lieutenant General James M. Gavin
United States Army, Retired

LTG Gavin wrote these apt words in 1958 (see War and Peace in the Space Age [New York: Harper and Brothers, 1958], p. 134) shortly after retiring from his position on the Army staff as director of research and development because he could not support Eisenhower's policy emphasizing nuclear forces at the expense of conventional arms. They are apt words especially in light of LTG Gavin's pioneering role in the development of airborne training and doctrine. Readers of this history will readily see that the TRADOC Test and Experimentation Command (TEXCOM) Airborne and Special Operations Test Board (ABNSOTBD) and its predecessors have all lived up to their spirit. It has indeed been, and continues to be, the Board's mission to understand and master the technology that so much enhances our national arsenal. The purpose of the present study, then, is to help document and commemorate fifty years of achievement in the field of user and operational testing of the Army's airborne and special operations acquisitions.

The original inspiration for this work derives from the current President of the Board, COL Frederick J. Hillyard, who also provided the support of his staff. Mr. Charles Peeler, COL Hillyard's deputy, has poured over the text, making many useful suggestions and improvements. The ABNSOTBD photographic laboratory and Mr. Dave Davenport provided a plethora of interesting photographs.

This work could not have been undertaken without the encouragement and support of MG William C. Page, Jr., TEXCOM's Commander, and his Chief of Staff, COL Kenneth E. Kimes. They made the resources of the Office of the Command Historian available for the project and approved the expenses incurred during research at various archives.

Dr. Alfred C. Mierzejewski, formerly the TEXCOM Command Historian, directed the project through the completion of the first draft and saw it through several revisions, improving it considerably. He, like the author, could not see the work

through publication. That task as well as some final editing and arranging of illustrations was left to the undersigned.

This study was written by Mr. Robert L. Johnson II, a promising young historian who holds a degree in military history from Texas A & M University. Mr. Johnson currently teaches history at the University of Alabama at Tuscaloosa, while continuing his studies of military and naval history. Since he was not in a position to do it himself, Mr. Johnson has detailed me to gratefully acknowledge our gratitude, not only to the folks already mentioned but also to a number of others across the country: Mrs. Jean Autry of the Board for all her efforts; Mr. Bob Reid, Mr. Paul Sutton, Mr. Dexter Hall, Mr. John Hall, and Mr. Bertram K. Gorwitz for consenting to be interviewed; Mr. Jim Lee of the Board; Mr. Mr. Ed Giebutowski and Mr. John Greendale of the Natick Army laboratory; Mr. Steve Anders of the Quartermaster Center and School; Mr. Leonard C. Weston, Command Historian at the Test and Evaluation Command; and Mr. Dick Grube of the National Infantry Museum. In addition, the author wishes to thank the archivists at the National Record Center at Suitland, Maryland, and the librarians at the Army Infantry School Library. We wish to thank all those busy people, both those named here and those unnamed, who donated their time and help to make this work better.

The undersigned wishes especially to thank Mr. Peeler and Mrs. Sheryl Pendleton for their considerable help with the final editing. Whatever failings remain, despite the efforts of all these folks, are my responsibility.

Jose Alfredo Bach, Ph. D.
TEXCOM Command Historian
HQ TEXCOM
Fort Hood, Texas

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CHAPTER I
WORLD WAR II AND THE BIRTH OF THE AIRBORNE BOARD[1]

The use of some form of cloth canopy to slow a drop from the sky is an old idea, going back at least as far as Leonardo da Vinci. During the First World War, the Germans began to equip their pursuit pilots with parachutes in case of emergencies.[2] Billy Mitchell proposed actually dropping troops into battle behind the enemy to seize Metz in 1918. General Pershing accepted the plan. The war ended before Mitchell could carry out his bold scheme, but the seed had been planted.[3]

With the advent of larger, more powerful, and roomier transport aircraft in the 1930s, air transportation of cargo and troops became the subject of serious attention in all modern armies. The French, British, Russians, and Americans all experimented with transporting troops and equipment by air. Some rudimentary work was even done on what might be considered assault landings. As early as 1927 Italy formed combat units organized and equipped to be dropped by parachute into combat.[4] The U.S. Army conducted an abortive test with parachute equipped soldiers in 1928.[5] In 1931, the Red Army organized an experimental parachute assault unit. Battalion sized units were being used in exercises by 1935. The Germans used airlanding tactics during the occupation of Austria in October 1938.[6]

Another interesting possibility was to transport infantry units by air to a certain objective, then drop them by parachute to capture and hold it. The French and Russians performed a variety of experiments with this technique. The Germans also began work on airborne units in the late 1930s.

The American airborne effort began on 6 May 1939 when the Chief of Infantry suggested that a small detachment of "air infantry" be formed. The Chief believed that the infantry regiment, as currently organized, could be adapted to this purpose with little change in materiel or organization. The Infantry Branch began to study the actual materiel and supply needs of such a unit, how it would be controlled by higher headquarters, and how it would work with the Air Corps.

Once the Infantry proposed such units, other branches and services promptly showed interest, and a three-way struggle over control of airborne troops broke out in the fall of 1939. The Chief of Engineers contended that the mission of airborne soldiers would primarily be demolition and sabotage, which rendered them more suited to his control than the Infantry's. The Chief of the Air Corps liked the idea of airborne troops and wanted to institute an organization of such troops as "Marines of the Air" to be

designated "Air Grenadiers." He could point to the German example for support, for German airborne troops were part of the Luftwaffe.

However, the Chief of Infantry believed that aircraft were simply the means of transportation to the field for airborne soldiers. On the ground, they would be expected to fight as regular, if lightly armed, infantry, not merely as saboteurs. That fall the Chief of Infantry met with the Chiefs of the Engineers and the Air Corps and eventually won them over. For the time being, airborne troops would be controlled by the Infantry.[7]

The War Department authorized the Chief of Infantry to begin formal study of the airborne concept on 2 January 1940, and on 12 January he designated the Infantry Board to conduct a preliminary study of the concept.[8] In March, the Chief of Infantry sent the results of this study, together with a plan for a test of the concept to the War Department. On 25 April, Washington informed the Chief of Infantry that it had approved the test plan. In addition, it laid the ground work for Air Corps cooperation with the Infantry in the project by designating the Commanding Officer of Flight B 16th Observation Squadron as the Air Corps' liaison to the Infantry for the airborne venture. Washington also ordered Air Corps Materiel Command to develop a parachute that would be safe to jump from low altitudes.[9]

While the Americans were busy organizing an airborne test, the Germans were demonstrating the use of airborne troops in combat. The Germans faced strong defenses in their attacks on the Low Countries and France, and used airborne troops to overcome many of them. Airborne forces seized key bridges in the Netherlands, paving the way for the armored divisions. Glider troops landed on Fort Eben Emael in Belgium and put it out of action. The Germans' effective use of these units had a twofold effect on the American airborne experiment. Not only did it provide additional stimulus for the project, it also demonstrated some basic tactical guidelines.

Back in the States, enough background work had been done that it had come time to organize a unit to test the airborne concept for the U.S. Army. The Army took the first steps in the actual formation of this unit on 25 June 1940, when the War Department ordered the Infantry School to organize a test platoon of parachute troops composed of volunteers from the 29th Infantry Regiment. The platoon was authorized one lieutenant, six sergeants, and forty-two privates. The unit would be attached to the Infantry Board for special duty, and its members would receive flight pay in accordance with the standards of the Air Corps. In order to offset the loss of personnel, seventy additional privates and specialists were dispatched to the 29th Infantry.[10]

The Infantry Board was charged with carrying out the test and developed an eight week regimen to train the platoon. This program, which laid a heavy stress on physical fitness, as well as instruction in parachute packing, flight orientation, and jump techniques, was laid over a continued program of standard infantry training. The troops were to make a series of individual jumps before proceeding to a mass jump in the final week.[11] The tactical situation visualized for the platoon's mass jump operation was "employment . . . in Hemisphere Defense to seize landing areas where only light opposition is expected and to secure the areas for short periods until reinforced by Air Infantry [sic]."[12] The Infantry Board was ordered to develop a research program to investigate the following issues:

a. Organization of a parachute platoon
b. Uniform and equipment for the platoon including arms and special equipment
c. Training necessary for the platoon
d. The method of landing troops and equipment by parachutes
e. The practicality and feasibility of employment of the platoon under the assumed conditions
f. Indications of tactical methods.[13]

The Infantry Board conducted a series of examinations to select the leader of the test platoon. The clear winner was LT William T. Ryder. He had begun studying airborne operations several months earlier, when he first heard about the Army's interest in them, and he had even prepared some rudimentary treatises on parachute techniques. As the training of the test platoon progressed, need for a second officer emerged and LT James A. Bassett became assistant platoon leader. While the selection of the platoon leader was being conducted, the 29th Infantry was also being canvassed for troops to make up the test platoon, yielding some two hundred volunteers. The War Department assigned an Air Corps flight surgeon to conduct physical examinations of these troops, applying the highest standards. Yet, narrowing the number down to forty-eight was difficult. Some sergeants even volunteered to "take a bust," i.e., give up rank, in order to be part of the test unit.

By the beginning of July, selection had been completed, and the test platoon began its eight weeks of training. Besides the flight surgeon and liaison officer, the Air Corps provided a warrant officer and four riggers to help instruct the platoon in parachute packing. As training began, the platoon moved to a tent camp near Lawson Field to be closer to the aircraft from which it would jump. During the summer Lieutenant Colonel William C. Lee, who had earlier been one of the driving forces behind establishing the airborne effort, visited the New York World's Fair and saw a demonstration of jump towers. These structures struck him as potential training aids to

the parachute platoon. At the end of July, the platoon moved to Hightstown, New Jersey, for a week of training on the towers owned by the Safe Parachute Company. This training proved so beneficial that larger versions of the towers were built at Fort Benning for future airborne training.

1. Captain Ryder in the doorway in his jump suit, talking to Major Miley (left), the first commander of the 501st, and an unidentified soldier (right). (*National Infantry Museum, Fort Benning*)

A new complication appeared during the summer project. A regulation existed limiting parachute jumps to greater than 1,500 feet altitude, but this was not viable for combat-bound airborne troops. The test platoon did its initial jumps from this altitude, however, and initial individual jumps continued to be done from that height. The regulations were amended, however, to allow for jumps of parachute troops in training and combat as low as 750 feet.

In late August 1940, the test platoon undertook its first jump. LT Ryder decided to lead by example. The honor of being the first *enlisted* paratrooper in the U.S. Army was determined by drawing lots. On the first pass over the jump area at Fort Benning, LT Ryder plunged out of the transport aircraft and floated safely to earth. The lucky first enlisted man stepped to the door, but was welded to the floor of the plane by fear.

Before long the aircraft had left the drop zone. The jump chief talked to the young man who assured him that he would like to try again. The pilot brought the plane around again and the soldier boldly stepped to the door, gazed at the ground far below, and promptly froze. At this the chief moved him out of the way and PVT William "Red" King strode forward and unhesitatingly jumped. King thus became the first enlisted man in the U.S. Army to become a paratrooper.[14]

The establishment of the test platoon led to a stronger belief in the airborne project and a renewed struggle over control of the troops. The Air Corps renewed its bid for control of the airborne, and a new player, the G-3 Division of the War Department, also attempted to seize control. On 27 August, the Deputy Chief of Staff of the Army held a conference in Washington which laid the matter to rest for good. Airborne units would be controlled by the Chief of Infantry.

Two days later, before a large crowd of VIPs, the test platoon made its first mass jump. They parachuted successfully, consolidated on the ground, and seized their objective. The observers -- among whom were included General George C. Marshall, the Chief of Staff and Henry L. Stimson, the, Secretary of War -- were duly impressed.[15]

The successful mass jump completed the test platoon's initial work, and the Army promptly began to form tactical units. The First Parachute Battalion was constituted on 16 September 1940 and redesignated the 501st Parachute Battalion on 2 October.[16] The test platoon provided the cadre for this unit, which began to train new airborne troops.

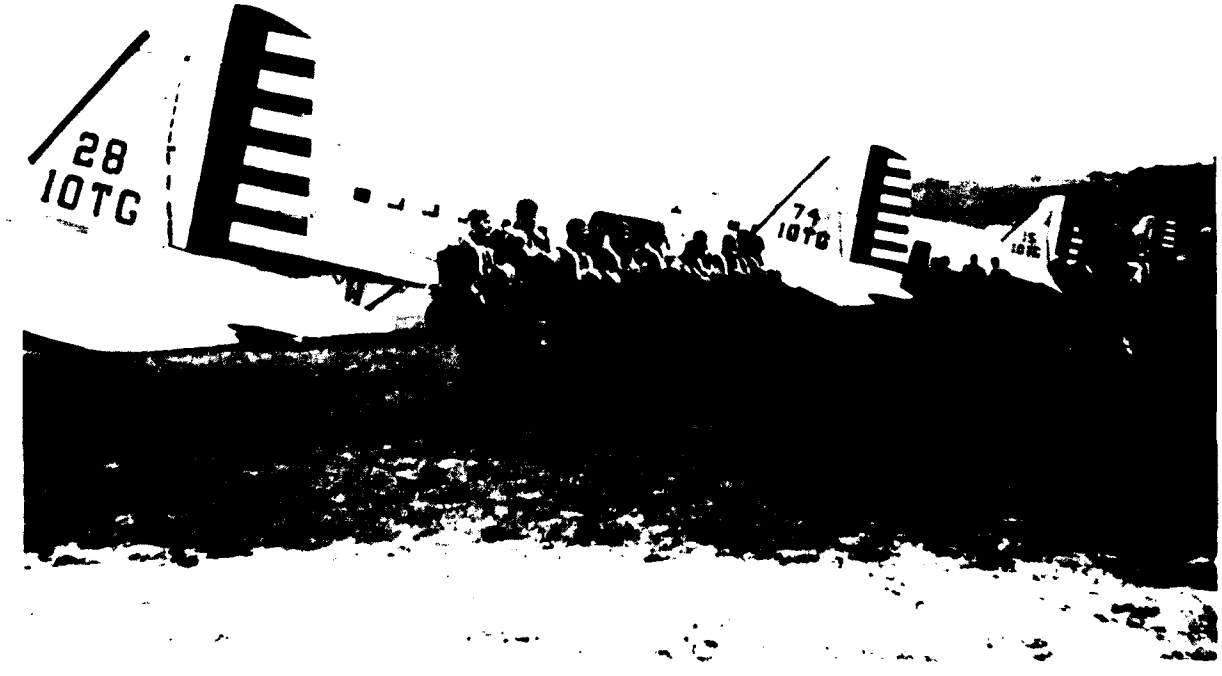
2. Parachute test platoon.[17] *(Airborne and Special Operations Test Board)*

HALEY, KELLY, SMITH, WARD, KITCHENS, IVY, POUDERT, PETERS, MCLANEY, COLEY, MONTISETT, SHEPHERD
CORBIN, BURKHALTER, ROBERTS,BROWN, KING, RUTLAND, HARDIN, MCCULLOUGH, KASELL , DOOD, WILLSON
VOHLS, GUILBEAU, PITTS, DOUCET, LT. RYDER, LT. BASSETT, W/O WILSON, WALLACE, HARRIS, WADE, PURSLEY, DAVIS, SKIPPER
REESE,ROBINSON, JACQUAY, CORNELLIOUS, SELMAN, KIRKSEY, EBERHARDT, WEEKS, BOROM, ADAMS, TRACY
ABSENT: BROWN,I., DILBURN, ELLIS, HOUSTON, KETCHERSIDE, SWILLEY, WILLSON, D., YATES

In the meantime, however, much development remained to be completed. The equipment and arms of the airborne soldier needed selecting and standardizing, tactics for the platoon required finalization, and tactics for larger units had to be formulated. Further, another Army effort, directed at airlanding troops in gliders, also needed to be assimilated into the airborne effort. All this took place while larger units of airborne troops were being trained.

For the moment, the testing of materiel for the nascent airborne units remained the responsibility of the Infantry Board. Meanwhile, Bassett had been promoted to Captain and had transferred to the Infantry School as an Assistant Plans and Training Officer. He also became the supervisor of airborne test and development efforts. He was assisted by LT W. P. Yarborough, as test officer for organizational equipment, LT L. Alverson, for individual equipment, and LT J. J. Ewell, a communications equipment expert. These officers were in turn assisted by SGT Clay C. Daniels, armorer artificer, who was also designated as custodian of all property of the test section, and CPL L.C. Rutland, rigger, who was responsible for inspection and maintenance of parachutes.

The mission charged to these men was tremendous and was by no means limited simply to developing the equipment for the Army's own paratroops. They found



3. Parachutists, equipped with T-4s, receiving instructions before boarding C-47s.
(National Infantry Museum, Fort Benning)

themselves haggling with an often recalcitrant Air Corps over the design or adaptation of aircraft for airborne use. For instance, the delivery of heavy equipment for the paratroops remained a difficult proposition. In order for the troops to make use of their heavy equipment, it had to be dropped in a close pattern with them, preferably at the same time, to prevent dispersion, which might cause it to be lost. If troops were jumping out of the doors of the transports, equipment bundles could not be pushed out at the same time.

The Infantry wanted to have bomb racks affixed to the Air Corps transports in order to carry the bundles externally and drop them at the same time as the troops were jumping. The Air Corps balked at this, believing it would dangerously detract from the performance of the aircraft, as well as raising the safe control speeds of the planes. Eventually, after much argument, tests proved that the bomb racks were practical, and that their effect on performance was within acceptable limits.

Among the topics over which the testers disputed with the Air Corps (later Army Air Forces) were the size of the jump doors on the aircraft, the addition of second jump doors to the planes, and the location of static line cables. The very nature of airborne troops dictated close association with the Air Corps and its descendents, and early on an airborne representative was stationed at Headquarters, Materiel Division, Army Air Corps, Wright Field. This liaison was continued through the war and after. Eventually, the Air Force activated an Airlift Center at Pope Air Force Base, collocated with Fort Bragg at Fayetteville, North Carolina, to maintain this contact with the Army.

The adaptation and development of transport aircraft for airborne use was an important concern, both to the Infantry and the Air Corps, but more important to CPT Bassett and his associates was the development of the personal and unit equipment of the airborne troops. Much of this work was also done with Air Corps assistance.

The development of a parachute for airborne troops was probably the most important of these projects. The parachute used by the test platoon was an Air Corps standard T-3, meant to be used in emergencies to escape from aircraft. While adequate for this use, it had some drawbacks that made it undesirable for continued use by airborne troops. The Infantry School and Quartermaster School worked with the Air Corps to make the T-3 more suitable. The first improvement adopted by the airborne was the T-4, a modification for static line jumps. The canopy was a simple flat circle twenty-eight feet in diameter without any special features. The harness fastened in front with three snaps. This harness was difficult to unfasten quickly. The lift webs for the reserve chute were permanently fixed to the harness.

4. A paratrooper, possibly Captain Ryder. (*National Infantry Museum, Fort Benning*)

The T-4, while an improvement over the T-3, still left much to be desired. In particular, the trooper could not carry any weapon larger than a pistol while jumping. The Germans had faced a similar problem and had resolved it simply by dropping the troops' weapons in a separate canister. This was not an ideal solution, however, because the troops were virtually unarmed until they could locate and unload the canister. They had encountered severe problems with this system during their landings in Crete. Other problems with the T-4 included its unreliability and its lack of suitability for static line jumps.

Work on personnel parachutes therefore continued, eventually resulting in the T-7. This parachute was designed specifically for static line jumps, but retained many other features of the T-4. Among these was the three point harness, which generally was a good piece of equipment, but still was very hard to get out of. A dazed trooper

often could not remove the assembly because of the cumbersome release mechanism. Later in the war the T-7 was equipped with a single point "Irving" quick release box, based on a German development of an American design. A less positive hold-over was a canopy-first opening sequence which resulted in a severe opening shock. However, for the moment, the T-7 was superior to other parachutes available, and became the standard airborne parachute through World War II, and for a decade beyond.

5. Paratrooper in a T-4 parachute. (*National Infantry Museum, Fort Benning*)

Initially, CPT Bassett and his group spent much of their time testing and evaluating:

> . . . the thousand and one plans and ideas submitted from the nation at large and to eliminating those submitted by crack-pot artists, mechanics, and inventors. With the release of information that a parachute organization was to be activated in the United States Army, it appeared that every inventor or cellar mechanic who had any ideas regarding floating through the air, with or without a parachute, submitted his gadget or idea to the War Department.[18]

Unfortunately, most of these ideas were simply impractical or could not be adapted to military procedures. Particularly common were suggestions to soften the landing of parachutists, usually by some sort of cushion or padding to the feet. These were generally rejected because they usually lengthened the distance between the ankle and the ground, which "decreases the lateral stability of the ankle joint, which in turn decreases the stability of the knee joint, which is already a notoriously unstable joint."[19]

In addition, CPT Bassett's organization also had to work on suggestions coming from within the Army itself. The entire idea of airborne troops was new, and little or no equipment existed for them. It all had to be developed from scratch. The unique nature of airborne troops "presented problems whose solution required that careful thought and consideration be given to each item of equipment and materiel, from the footgear of the individual soldier to the parachute with which he descended or the glider or powered aircraft in which he was transported and landed."[20]

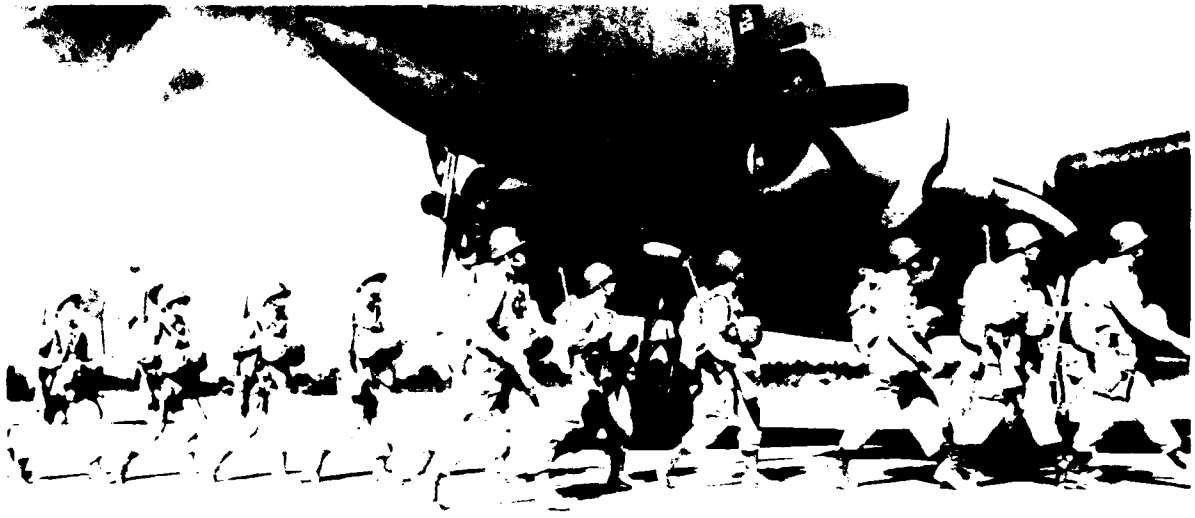
The Army wanted airborne troops to use standard equipment as much as possible to reduce logistics difficulties. For that reason standard equipment was tested with the goal of issuing it unmodified to airborne troops. After that, the testers focussed on developing modifications of standard equipment for airborne use. Only when standard or modified equipment could not safely and effectively fit the bill was specialized equipment developed.

During 1941, suggestions from outside of the Army were directed to the War Department, which passed them on to the Chief of Infantry. Developments within the Army generally originated with the Chief of Infantry himself. The Chief of Infantry then directed the test to the Infantry School, which ordered the Infantry Board to conduct the test. The Test Section of the Board then assigned the test to the working officer, in this case, Bassett, Alverson, or Ewell. This was in accordance with the usual operation of Army testing at this time, in which each arm or service of the Army operated its own test and evaluation system. In general, however, tests were assigned to a Board controlled by the chief of the arm or service.[21]

Such boards have a long history in the U.S. Army. The lineage of Boards is usually traced back to the War for Independence, when a Board of Artillery was formed. Over the next twelve or so decades, the Army formed temporary boards sporadically, usually with a specific goal in view. The first permanent board was also an Artillery Board, formed in 1902 at Fort Riley, Kansas. Later Infantry, Coast Artillery, and other Boards were formed.[22]

In the interwar years, a dichotomy emerged between the using arms (Infantry, Cavalry, Field Artillery, and Coast Artillery) and the supply services (Ordnance,

Quartermaster, Chemical Warfare, and Medical Services) in terms of their role in the development of new weaponry. The supply services had responsibility for the technical development of equipment and materiel, while the using arms originated requests for new developments and tested them to ensure that them fit military requirements and were suitable for use in the field. On the eve of World War II, this had grown into a system of development that included phases of technical and user testing, as they are now often called. These phases were conceived as sequential steps in the development of new equipment. It first had to complete developmental testing before proceeding to service testing. Upon completion of service testing, the user and developer would meet to decide whether to adopt the materiel, and if so whether to classify it as standard issue, a substitute, or a limited issue. Service testing occasionally included troop testing in which limited quantities of the materiel under test would be issued to troops for evaluation and sometimes some initial work on the development of tactics. During the War, troop testing, including limited combat testing, became almost a standard procedure.[23]

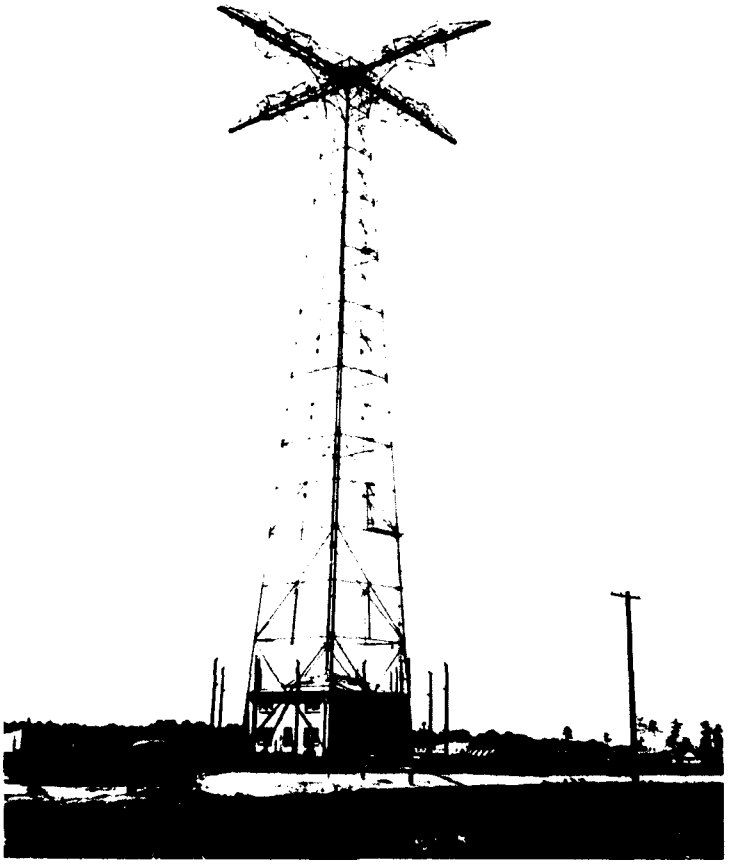


6. Paratroopers wearing T-7 parachutes boarding a C-46 Commando. (*Airborne and Special Operations Test Board*)

As yet, there was no Airborne Board, the airborne itself being subordinated to the Infantry. CPT Bassett and his subordinates were assigned to the Infantry Board, which provided most of the supporting apparatus for airborne testing.

While the Infantry Board could provide this support, it could not provide an even more important item: test units. Even while the early airborne equipment was being tested, the first tactical units were being formed and trained. Although

participation in testing was beneficial, it distracted troops from training. The problem became acute enough that in June 1941, the War Department decided that a special test unit should be formed. Completing this task took the rest of the summer, and on 10 September, the War Department finally announced the formation of the 88th Infantry Airborne Battalion, constituted specifically as a test and experimentation unit. The Battalion was to be under the direct control of the Chief of Infantry, and was to consist of five hundred enlisted men, fifty to be selected from the 9th Infantry Division, the rest to be drawn from infantry replacement training centers. Field artillery and Army Air Forces support would be arranged later.[24]



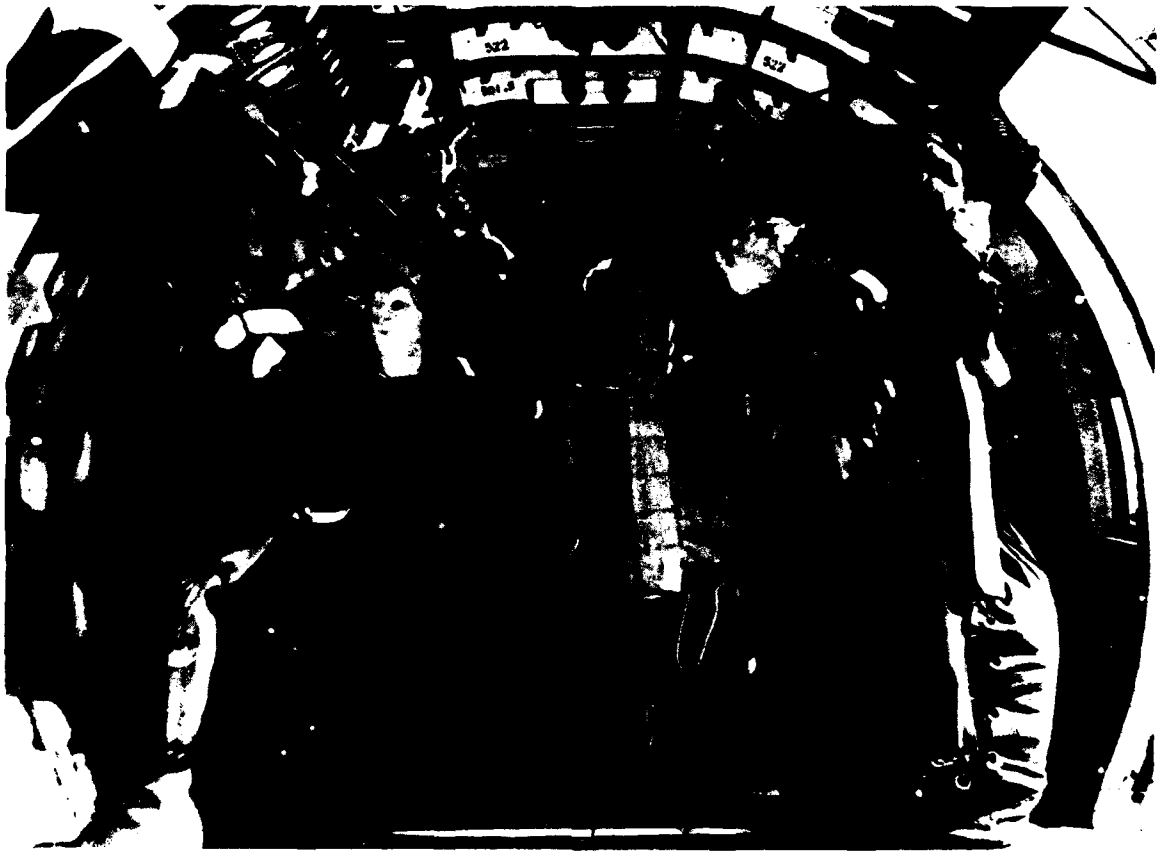
7. One of the Jump towers at Fort Benning as it looked in 1942. (*National Infantry Museum, Fort Benning*)

With the formation of the 88th Infantry Airborne Battalion, the Infantry Board was relieved of the responsibility for testing airborne equipment and techniques. The 88th Infantry Airborne Battalion conducted all development, testing, and evaluation of

training, tables of organization and equipment, logistics, and tactics. It also had the responsibility of developing methods for combat loading of aircraft, including internal and external distribution of loads, and lashing techniques. Its reports were to incorporate both written and diagrammatic descriptions of the techniques that it developed. The Battalion was also charged with evaluating transport aircraft, both current and proposed, for use as airborne transports.[25]

The Army Air Corps had become the Army Air Forces in 1941. In 1942, the remainder of the Army reorganized along the same lines. Ground combat operations were consolidated under the Army Ground Forces (AGF) while supporting organizations were unified under the Services of Supply (later the Army Service Forces). One goal of this reorganization was to give the newly developing arms and branches some freedom to develop while consolidating control over the older branches. Thus, Infantry, Cavalry, and Field Artillery units within the United States were placed under control of the Replacement and School Command, not directly under AGF. The newer branches, Armor, Tank Destroyer, Air Defense Artillery, and Airborne, were established directly under HQ, AGF. In order to foster their development, each of these new tactical elements had a "special establishment" to develop equipment and doctrine, and to train both officer and enlisted personnel. In descending order of priority, these were called forces, commands, and centers. Armor, for instance, had already demonstrated that it was going to be a major player in ground combat; hence, its "special establishment" had been designated as Armored Force. On the other hand, fighting in special environments, while it would require special training, did not necessarily entail developing completely new units, doctrine, and equipment. Hence, desert and jungle training took place at Centers designated for that purpose. Army Ground Forces considered airborne to be midway between these two extremes, and its "special establishment" was initially designated as Airborne Command, with Headquarters at Fort Bragg, North Carolina.[26]

Airborne Command asked AGF for permission to establish a service board on a par with those of the other services, relieving the 88th Infantry Airborne Battalion of this responsibility, but the request was denied. Therefore, development, test, and evaluation responsibility within Airborne Command, was assigned to its G-4, under Colonel Joseph A. Hinton. James Bassett, who had by now been promoted to Major, continued to be directly responsible for testing and evaluation. The Parachute School at Fort Benning had also inaugurated a Test Section, which continued to operate unofficially as a branch of Airborne Command's test and evaluation apparatus. Captain William Lindsey was in charge of this section.



8. "Young hands find the sides of their door, knees bent. . . ." (*National Infantry Museum, Fort Benning*)

During the dark days of mid-1942 with Allied troops retreating on every front, testing and evaluation were a minor concern to Airborne Command, and each unit was allowed to develop and test its own equipment. Many units fabricated their own containers for dropping individual and unit equipment. Others, feeling that their unique situation overrode established tables of equipment, adopted new designs over those already established by earlier testing. Lack of standardization soon became a problem among airborne units.

The Commanding General of Airborne Command finally faced this problem in September 1942, and consolidated all testing and development of equipment within the G-4 section of Airborne Command Headquarters, under the direct charge of Major Chester B. DeGavre. At this point, MAJ Bassett seems to pass out of the history of the Airborne Board and its predecessors. He had started as Assistant Platoon Leader in the Test Platoon, and early initiated test and evaluation activities within the Platoon. When the rest of the Platoon went on to provide cadre for the early airborne battalions, the Major returned to the Infantry School to continue test and evaluation of airborne

equipment. Later, when Airborne Command was activated, he moved into that headquarters, with continued test and evaluation responsibility. He provided the tenuous link between the Test Platoon and the later test and evaluation predecessors to today's Airborne and Special Operations Test Board.

Even with all test and development responsibilities merged under Airborne Command's G-4 section, all problems were not solved, and at the end of November, G-4 was relieved of this task. A separate Test and Development Section was established to concentrate all such activities of Airborne Command in one section, including the responsibility for developing and testing new equipment and advising the Command as to new equipment and materiel requirements. The Test and Development Section of the Parachute School continued to operate as an unofficial branch of this section.

The Test and Development Section of Airborne Command began to promote standardization and establish test procedures for airborne units, but with very slim resources. The personnel of the Section included only the Chief of the Section, a clerk, a stenographer, and a rigger. The Section itself had no organic facilities and depended upon the courtesy of the unit riggers assigned to Fort Bragg for space to fabricate containers and develop new rigging techniques. Even under these spartan conditions, the Section made a start at imposing some standardization as well as continuing development of new drop equipment.

In April 1943, some of these complications were alleviated. The Test and Development Section moved to Camp Mackall, where packing, maintenance, and workshop space was available. Further, Airborne Command decided to concentrate all test and development facilities and personnel at Camp Mackall. With the exception of CPT Lindsey, Director of the Section, who also became the Parachute School's Liaison Officer to the Infantry Board, the personnel and equipment of the Test and Development Section of the Parachute School moved to Camp Mackall, and were absorbed into Airborne Command's Test and Development Section. Not only did this consolidation make more personnel available to Airborne Command for testing, it reduced the packing and maintenance requirements for these activities, since some duplication was eliminated.

Even with the addition of the personnel from Fort Benning, the Test and Development Section did not have sufficient manpower to complete all of the tasks assigned to it, and had to delegate some testing to airborne units stationed at Camp Mackall. But detailing the testing to combat units soon proved to be an unsatisfactory expedient. While the combat commanders had an opportunity to supervise these tests and learn about the new equipment firsthand, they did not have the experience to do a

completely adequate job of testing. They approached testing without a truly coherent methodology, and their reports were incomplete and usually inconclusive. The Test and Development Section found its burden increased rather than lightened, since it had to re-run many tests. Airborne Command concluded that the most efficient way to get testing done was to develop the Test and Development Section into a full-fledged test organization, which it did in August of 1943.

The major concern of the Test and Development Section was standardization of equipment between airborne units and the rest of the Army. As mentioned above, the adoption of as much standard issue equipment as possible became a major goal. This had not been true in the early months, however, and considerable effort had gone into designing equipment specifically for airborne use. One example was the beloved jump boot manufactured specially for airborne troops. The airborne troops also felt that their boot was far superior to the standard combat boot. But in 1942, the need for a special jump boot was questioned after tests run with the standard combat boot showed that it performed just as well as the special boot. About the only real benefit that the jump boot provided was the morale boost that it gave the airborne soldiers by being distinctive. Understandably, they wanted unique uniforms to distinguish them from other troops, and they were reluctant to adopt the standard combat boot. The exigencies of war won out, however, and they were compelled to wear standard combat boots. Nevertheless, the Airborne Center and its successors conducted tests until 1945 to determine whether the standard combat boot was in fact inferior to the jump boot for normal field operations. In the end, they only confirmed that the real benefit of the jump boot was to the morale of airborne troops.

The AGF organization of March 1942 was never meant to be permanent. It was intended to give the newly emerging arms the room and time they needed to develop their own equipment, organization, and doctrine. However, once these were established, General Lesley J. McNair, Commander of the Army Ground Forces, intended to return them to the fold to establish better coordination with the extant arms. By early 1944, he felt that the development had been completed, and the Army Ground Forces were again reorganized. In the course of this reorganization, the Airborne Command was downgraded to the Airborne Center, and merged with the other arms under the Replacement and School Command.[27]

The test and evaluation responsibilities of the Airborne Center were delegated to the Equipment and Materiel Section. This section consisted of one colonel, one lieutenant colonel, one major, a warrant officer, two staff sergeants, one sergeant, and three privates. This group was too small to execute tests itself, so units of the

appropriate size were assigned from the Airborne Center to the Equipment and Materiel Section to do the test under its supervision. For the most part, this arrangement was satisfactory, but the unit that lost the detachment lost control of it during the test, often disrupting training.

Two important developments in this period had a great impact on testing at the Airborne Center. In the summer of 1944, HQ AGF developed a new policy for testing that limited the Airborne Center to testing only equipment destined for airborne use. In the previous months AGF had delegated tests to the Test and Development Section and the Equipment and Materiel Section that were not necessarily related to airborne or within their field of expertise.

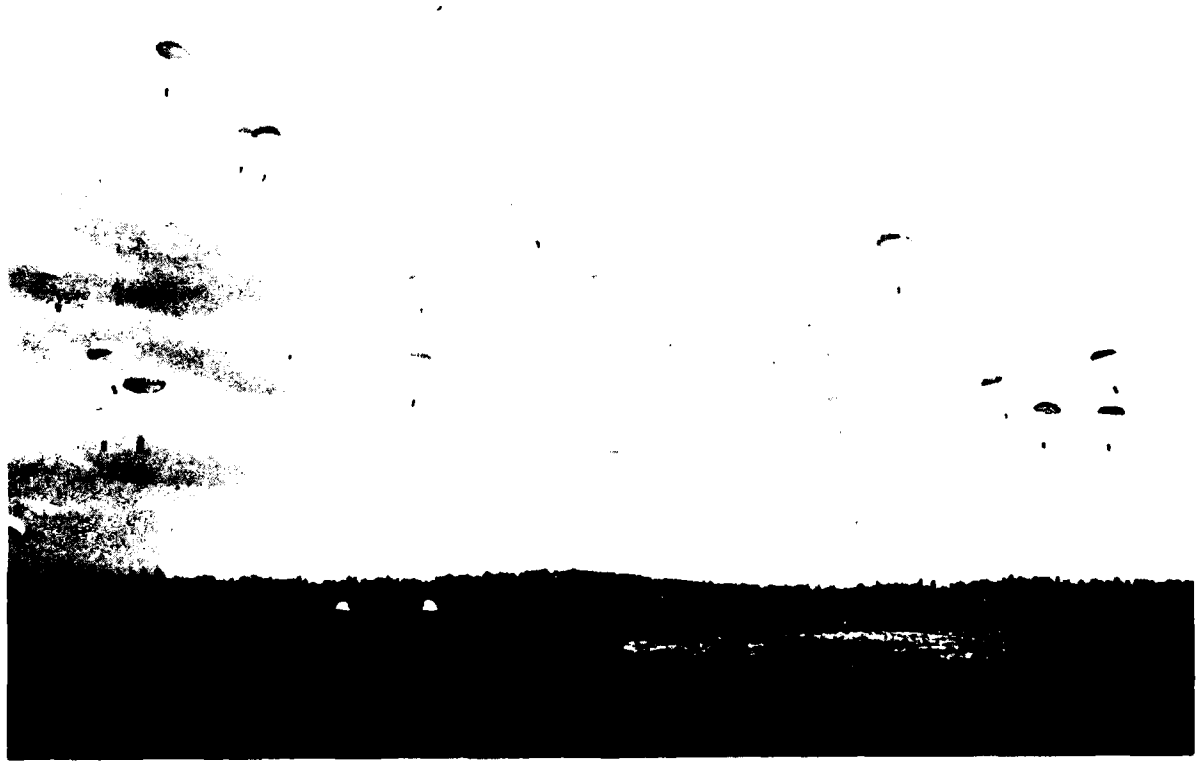
Even more important in practical terms was the establishment of the first theater detachment from the Equipment and Materiel Section. This gave the Airborne Center an opportunity to see its equipment in actual use in combat. Lack of practical experience had hampered earlier test and development work, and the Equipment and Materiel Section ardently desired this liaison. Such theater detachments were operated by most of the Boards during the War. They offered the Board the opportunity to observe first hand the employment of equipment in combat, while familiarizing theater commanders with new developments. They also acted as advisors to the theater commanders on matters concerning their specialty.[28] The detachment proved to be of great value both to the theater commanders and the Board.

Unfortunately, once established, this detachment tore the heart right out of the Section. The detachment included one lieutenant colonel, two majors, and fifteen enlisted personnel and was assigned to the European theater for duty with airborne units. This left the Section with a single officer to fulfill all of the duties of the Section, since the approval of the theater detachment had not brought with it a corresponding increase in personnel strength. Other officers from the Airborne Center helped the Section during this period, and some enlisted personnel were detailed from the Training Detachment, but operations were difficult for the next few months, until the Airborne Board was established.

Under the Equipment and Materiel Section, developmental work continued. A quick release device to free the parachutist from his canopy once on the ground had been a high priority, since the beginning of the airborne project. An early attempt at such an apparatus had been tested and rejected because it did not have a safety to prevent it from being used while the trooper was still descending. While freeing the paratrooper from the encumbrance of his parachute was important, safety was a

paramount concern. Therefore this quick-release device was rejected as unsafe, and the airborne troopers continued with the standard harness despite its drawbacks.

But by mid-1943, the tide of the war had changed, and enemy equipment became available for testing. Among the German materiel captured was a quick-release device used by their paratroopers. At the same time, combat experience had reinforced the imperative to develop a way to free the airborne trooper from his parachute as quickly as possible. Therefore, the German apparatus was submitted to the Test and Development Section for evaluation. Upon examining this device, the Section decided that the American-made device could work, though it would have to be modified somewhat. By the end of 1943 the modification had been made, tested, and accepted. Production was delayed while the tools needed to make the new device were themselves fabricated, and then the device was delayed in reaching airborne units even further by a claim put on them by the Air Forces. However, further combat experience had strengthened the demand for the quick-release device. Eventually, by early 1945 enough of the new devices had been produced that airborne units could be equipped with them.



9. A mass jump. (*National Infantry Museum, Fort Benning*)

By 1944, the need for an airborne service board had become clear enough that the Army set about establishing one. The Airborne Board was constituted on 17 November 1944, and inaugurated on 24 December 1944, culminating a series of developments stretching back over two years. The new board operated like any other service board; the president was assigned by HQ AGF, while the rest of the personnel were assigned by the commanding general of the Airborne Center. The first president of the Airborne Board was Chester B. DeGavre, who had recently been promoted to lieutenant colonel, and was later promoted to full colonel. The Airborne Board thus became the center of airborne development, testing, and evaluation. Additional personnel were assigned at this time to offset the theater detachment, which itself became part of the Board.

Membership in the theater detachments rotated among Board personnel, with the exception of the president and three enlisted men (a photographer, a clerk, and a draftsman) who served at the Board on a permanent basis. In July 1945, more personnel were assigned to the Board to enable it to send a similar theater detachment to the Pacific. The detachments rotated as a whole periodically.

As the war ended, the test and development facilities for the airborne forces had matured. A fully functioning Board had been established, with a strong background in practical testing. Theater detachments had been established in both the European and Pacific theaters, and were passing information back and forth between combat units and the testers. Finally, the early liaison with the Air Force had continued and matured, and work was nearly complete on a transport designed specifically for airborne use. The Board and its predecessors could look back on an eminently successful role in the development of the mature airborne force, having tested and evaluated most of its equipment.

The end of the War did not bode well for the Board, however. Economic retrenchment and reconversion, and the expectation of a new world of peace and harmony soon brought complications and frustrations to the Board.

NOTES

[1]Except where noted, most of this section is derived from The Airborne Command and Center: Study Number 25, Historical Section, Army Ground Forces, 1946 (WAR-10, 2-AGF, St25), pp. 1-6, 60-70.

[2]The early development of parachuting is discussed at some length in Gerard Devlin, Paratrooper! (New York: St. Martin's Press, 1979), particularly Chapter 1, pp. 2-27.

[3]Devlin, Paratrooper!, pp. 22-23.

[4]John Weeks, Assault from the Sky (New York: G. P. Putnam's Sons, 1978), p. 8.

[5]Ibid.

[6]Devlin, Paratrooper!, pp. 30-32.

[7]Ibid., pp. 36-37, 39.

[8]Airborne Command and Center, p. 2 citing War Department Ltr AG 580 (11-7-39) M-C to CofInf, 2 Jan 40, sub: Prcht Tr, Air Inf.; CofInf 1st ind, 12 Jan 40, on WD Ltr AG 580 (11-7-39) M-C to CofInf, 2 Jan 40, sub: Prcht Tr, Air Inf.

[9]Ibid., citing WD 1st ind AG 580 (3-8-40) M-C 25 Apr 40, on ltr CofInf to AG, 8 Mar 40.

[10]WD Ltr, AG 580 (6-11-40) M-Inf-C to Commandant, the Infantry School, 25 June 1940, Airborne Command and Center (Appendix No. 2), p. 84

[11]Ltr, Office of the Infantry School, Fort Benning, Georgia, to Chief of the Test Section, The Infantry Board, 1 July 1940, Subject: Parachute Troops and Air Infantry, Airborne Command and Center (Appendix No. 3), pp. 86-87.

[12]Ibid, p. 85.

[13]Ibid.

[14]Devlin, Paratrooper!, pp. 60-67.

[15]Ibid., pp. 71, 74.

[16]WD Ltr, AG 580(9-9-40) M-C-M to Chief of Infantry, Chief of Air Corps, and Commanding General, Fort Benning, Georgia, 16 September 1940, Subject: Constitution of 1st Parachute Battalion ; WD Ltr, AG 580 (9-26-40)M(ret) M-C to Chief of Infantry, Chief of Air Corps, and Commanding General, Fort Benning, Georgia, 2 October 1940, Subject: Constitution of 501st Parachute Battalion, Airborne Command and Center (Appendix No. 4), pp. 88-89.

[17][Editor's note: It was decided to include this photograph for the record, despite its lack of clarity, because the cutline of the original used identifies the members of the test platoon.]

[18]Airborne Command and Center, pp. 60.

[19]Airborne Center Equipment and Materiel Sec. File, 421.3-GNVEM, Subject: Uniform, Footwear (Boots, Parachutist), quoted in Airborne Command and Center, p. 60.

[20]Airborne Command and Center p. 59.

[21]HQ, U.S. Army Test and Evaluation Command, "Historical Summary of U.S. Army Service Testing", p. 5 (Hereinafter, "Hist. Sum. Ser. Test.")

[22]For an extended discussion of early Boards, see Ibid., pp. 1-5.

[23]Ibid., pp. 5-7

[24]WD Ltr, AG 320.2 (8-21-41)MR-M-C to Commanding General, 4th Corps Area; Chief of Army Air Forces; Chief of Infantry; The Surgeon General, 10 September 1941, Subject.: Experimental Air-Infantry Battalion, Airborne Command and Center (Appendix No. 5), pp. 90-91.

[25]WD Ltr, GI 320.2/9949, Office of the Chief of Infantry to The Commandant, The Infantry School, 8 October 1941, Subject.: Test of Airborne Infantry, Airborne Command and Center (Appendix No. 6), pp. 92-94.

[26]Kent Roberts Greenfield, Robert R. Palmer, and Bell I. Wiley, The United States Army in World War II: The Army Ground Forces, The Organization of Ground Combat Troops (Washington, D.C.: Historical Division, U.S. Army, 1947), pp. 390, 396.

[27]Ibid., p. 401.

[28]"Hist. Sum. Ser. Testing," p. 6.

CHAPTER II
CONSOLIDATION AND COLD WAR

The Army, along with the rest of the military, experienced great changes in the years following World War II. Like the conclusion of most American Wars, 1945 brought a period of retrenchment and disarmament. Money was tighter, and programs would take longer to complete over the next few years. The supply of manpower would also begin to decline as the massive Army of World War II was demobilized. The initial hopes for world peace were soon dashed by the gradual emergence of the Cold War, dominated by the shadow of nuclear weaponry. The Army searched for a role in this new environment, but was frustrated until the outbreak of the Korean conflict. This war brought renewed attention to conventional forces, and the Army experienced a brief resurgence. The respite was only temporary, however, as the "new look" of the Eisenhower administration placed greater reliance on nuclear weaponry through the doctrine of "massive retaliation." This period, the late 1950s, was a difficult one for the Army, well symbolized by the Pentomic Division, a failed attempt to reorganize the combat division in the face of the uncertain threat of atomic weaponry.

Strangely enough, however, this same period from 1945 to about 1960 was one of the most fertile for airborne testing, with the number of tests growing steadily throughout the period. The build-up for World War II had taught the Army that a constant program of research and development, including test and evaluation, was a necessity in peacetime given the pace of technological change.[1]

Headquarters, Army Ground Forces (HQ, AGF) took a number of steps in response to that felt necessity. Among these steps was the consolidation of various service boards under its jurisdiction. This consolidation would reduce duplication of effort, make the most of scarce resources, and "more completely accomplish . . . the views of Army Ground Forces."[2]

On 22 September 1945, HQ, AGF informed all boards that they would be deactivated effective at midnight, 30 September.[3] Their responsibilities were to be merged under three new AGF Boards to be activated on 1 October, whose activities would be regulated by function. Board #1 was to be headquartered at Fort Bragg, North Carolina, and was to be the "high tech" board. It absorbed several former boards as Service Test Sections. The Airborne Service Test Section was stationed with the headquarters at Fort Bragg. The Field Artillery Service Test Section was also co-located with the headquarters at Fort Bragg as was the newly established Communications and Electronics Service Test Section.[4]

While the responsibilities of the Boards were specified, HQ, AGF expected them to exchange information and ideas freely among themselves. The Boards were direct agencies of HQ, AGF, which would assign the president and all other personnel, and would also assign tests to them, but local commanders were expected to provide housing and messing facilities. The Boards were also to coordinate with the senior local commander for troops, equipment, and training areas for tests; conflicts over these matters, if they arose, were to be resolved by HQ, AGF.[5] While the personnel of each Board were to be assigned by HQ, AGF, each president was allowed the discretion to appoint liaisons to the other Boards, or to other agencies as needed.

With the end of hostilities, the two theater detachments were withdrawn from Europe and the Pacific, but the vital liaison to the Air Force was retained to continue Army input on the design of future transport aircraft. Another important liaison was established to the British Royal Army Airborne Training and Development Center.[6]

In 1946, the Board was reorganized. Due to demobilization, fewer soldiers were available while there were many civilians in need of jobs. Consequently, many of the positions at the Board, particularly in the administration, were converted from military to civilian.[7]

The Board also spent 1946 developing a workable organization. In March, the Service Test Sections were organized into four action offices subordinated to the G-3. These included an Artillery Section, encompassing the Field Artillery, Coast Defense Artillery, and Air Defense Artillery Service Test Sections; a Special Projects Section; a Communication and Electronics Section; and an Air Section, which oversaw the activities of the Ground Aircraft Service Test Section and the Airborne Service Test Section. This did not prove entirely satisfactory, so the Board tried a new approach, organizing all of the Service Test Sections under a Coordination Section, which would oversee all of their activities. Even this was not completely successful, and in March 1947 the Coordination Section was abolished. The Test Sections then reported directly to the Executive Officer of the Board.[8]

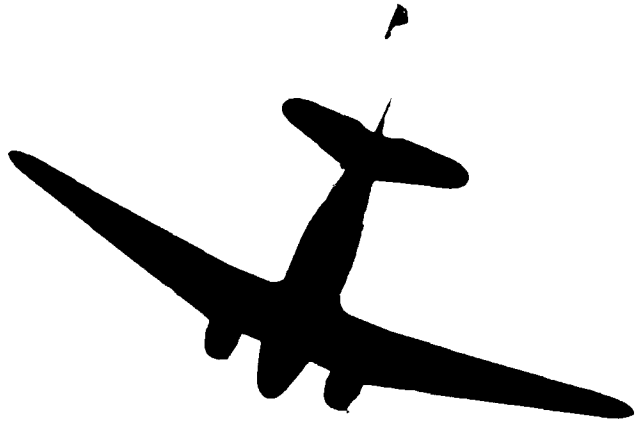
The National Defense Act of 1947 established an Air Force independent of the Army. This forced the Army to adjust. On 18 March Army Ground Forces became Army Field Forces, and the Board's name changed to Army Field Forces Board #1 to reflect this. While testing regulations were also altered to reflect the new situation, it was for the most part a change in name only. The existing organization and functions and operations of the Board changed little.[9]

In June 1948, Army Field Forces assigned all Boards to the command of the local Army commander. While they continued to function as test organizations of

Headquarters, Army Field Forces, all of their administration and command functions were taken over by the local Army commanders. Board #1 was assigned to 3rd Army, which in turn delegated oversight of the Board to the commander of V Corps.[10] This arrangement was not to the Boards' advantage, because the corps staff could not give proper attention to the Boards' fiscal, administrative, and personnel matters. In April 1950, the Chief of Army Field Forces again assumed control over all of the Boards' personnel matters, taking full control over them later.[11]

Between the end of World War II and the outbreak in Korea, the Board not only continued its work in testing airborne equipment, but also tested new aircraft for airborne use, and developed new technologies.

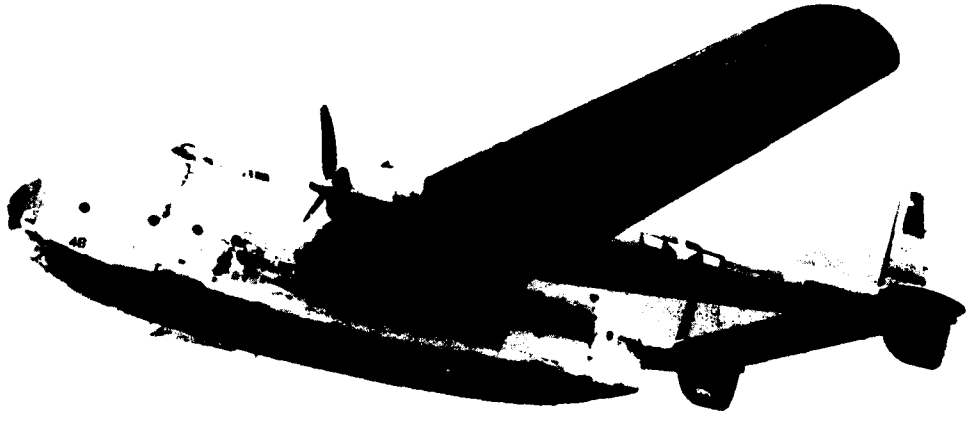
The transport aircraft most commonly used by airborne troops in World War II was the C-47 Dakota, a military version of the famous DC-3. The C-46 Commando was



10. Lone parachutist with T-7 parachute after exit from C-46 Commando aircraft. (*Airborne and Special Operations Test Board*)

also used late in the war. While adequate to the purpose at hand, these aircraft had a number of drawbacks, because they had been developed as civilian airliners and cargo transports, not for the deployment of airborne troops. While the C-46 did have two jump doors, the C-47 had only a single door, which took longer to jump a stick of troops. However, for both aircraft the cargo is loaded from side doors, which made the loading of much Army equipment awkward.[12]

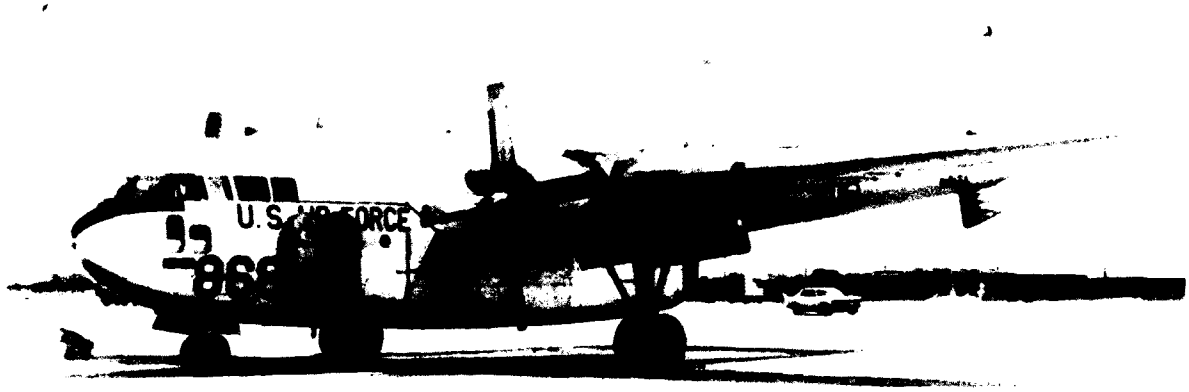
To alleviate these problems, the Army Air Forces sponsored the development of a transport designed for military use, with airborne requirements foremost in mind. This plane, the C-82, appeared at the end of the war. It had two jump doors, one on each side of the fuselage, to allow more men to jump with less dispersion. It also had clamshell loading doors in the aft fuselage to facilitate loading larger, heavier equipment.[13] The Airborne Service Test Section tested the C-82 to ensure that troops could jump from it safely. The Quartermaster School developed loading and rigging techniques for the new aircraft. The Section in turn tested them to ensure that they could be used by average troops under field conditions. Further, the Section developed a list of type loads to ease the task of loading the plane. Each of these "type loads" was a combination of equipment that could be carried by the C-82. Predefined type loads helped to distribute the materiel among the available aircraft.[14] In 1946 and 1947, the Section also demonstrated the C-82 to units in Europe and the Pacific, along with detachments from the Air Force and 82nd Airborne Division.[15]



11. C-82A Aircraft. (*Airborne and Special Operations Test Board*)

While the C-82 was a giant step in the right direction, it was not a completely satisfactory solution. In December 1946 and January 1947, the Department of War, the Army Air Forces, and the Army Ground Forces formed a committee to establish the

final characteristics of a military cargo transport. In general, they liked the C-82, but found it underpowered, rather small, and somewhat weak structurally. The Air Force also found the cockpit to be badly placed for airdrop formation flying. They decided to modify the C-82, and the result became the C-119 Flying Boxcar. The cockpit was moved forward to give the pilots better vision ahead and below for troop drops and formation flying. It's fuselage was widened by fourteen inches and strengthened, as were the wings. It was also built with more powerful engines. The Airborne Service Test Section certified the airplane for troop jumps and tested the rigging techniques developed for it by the Quartermaster School, and developed type loads.[16] The C-119 proved to be an effective aircraft, and was the mainstay of combat air transportation through the Korean War.



12. C-119G "Flying Boxcar." (*Airborne and Special Operations Test Board*)

During World War II a number of other issues arose as well. For example, the Army realized that it was badly prepared for operations under extreme climatic conditions, such as arctic, desert, and jungle. It learned much about the latter two through practical experience during the war, and continued to explore them afterward. Arctic conditions were another matter; the Army remained ill-prepared for them, and set out to redress this situation. Task Forces Frigid (1946) and Williwaw (1947), were the initial steps in this development, and the Board participated in both. United States troops in Alaska and some northern states, such as Minnesota and Michigan, conducted maneuvers to test existing equipment and develop requirements for new equipment or recommendations for adapting existing materiel. The ability of troops to work effectively under extreme cold was also a concern, as was the stress on equipment. Operations were conducted in a variety of conditions endemic to the arctic, including

cold, wet weather, such as is typical of early fall and late spring in the arctic, and progressively colder temperatures, including extreme cold, and stormy conditions. The maneuvers included both combat and support operations. At least one air assault troop drop was conducted to test airborne techniques in arctic conditions. All phases of supply airdrops were also tested, from loading through dropping and recovery.

The Army discovered that men could not be pushed too hard in arctic operations, that periodic rest was very important to efficiency and safety. Furthermore, much airborne equipment had to be modified for arctic operations. The release handle for the reserve parachute, for instance, was too small to be pulled by troops wearing arctic gloves. A larger handle was developed, which the Board tested, as it did other arctic-modified equipment.[17]

The conclusion of the second world war had also brought a profusion of captured enemy equipment, including some airborne equipment. Much of this was brought to the Board and evaluated for contributions to American equipment.

One of the more important developments of the late 1940s in the airborne field was the Heavy Drop technique. During World War II, there was a limit on the weight of equipment that could be dropped. Some loads, such as certain artillery pieces, were disassembled and dropped in pieces. For other equipment, such as jeeps, this was impractical. Further, experience during the war showed that dropping equipment in a dismantled state was a less than optimum solution. It took valuable time to reassemble the equipment, time that was not always available in combat. Sometimes, the materiel was dispersed because some bundles were scattered by wind conditions. It was much more helpful to deliver such equipment in its completed state, so it was available for use almost immediately upon landing.[18]

The Wright Air Development Center of the Air Force's Air Materiel Command began development of heavy drop methods in 1947.[19] The technique is basically very simple. Several parachutes are affixed to the load pallet, the actual number being determined by the total weight of the load. The load itself is rigged to the pallets, resting on some combination of paper honeycombs and plywood, which are used to absorb the impact when the load touches down. The basics have remained the same ever since, although the Quartermaster School must develop new rigging techniques for each new piece of equipment the Army wishes to airdrop, and not all equipment can be airdroped. For instance, the School had a difficult time developing rigging procedures that allow the M-561 "Gamma Goat" to be airdropped safely.[20] It was initially unstable and tended to tumble during the drop. It was not to be certified for heavy drops until 1972.[21] Not just techniques, but materials have remained essentially the same as well.

Paper and plywood are still used for shock absorption because they remain the most efficient and cost effective materials for this purpose; plastics have not proved to be economical.[22]

Heavy Drop also promoted another development in airdrop technology. During World War II, some equipment was dropped in bundles rigged to bomb racks on the bottom of transport aircraft. Others were physically pushed out of the aircraft by the crews. The Heavy Drop system initially worked in a similar way. The load was rigged to a pallet that rode on skate wheels. The pallet was loaded into the aircraft and tied down. When the load was to be dropped, the load was unlashed and pushed out of the cargo door, using its weight to deploy the parachutes. This system was dangerous, because unlashing the load left it free to shift about inside of the airplane. A slight bump caused by minor turbulence could thus have a drastic effect on the stability of the aircraft, and the chance for a disastrous crash was very high.[23]

The Air Force then developed a new technique. Roller conveyors were installed on the floor of the cargo bay of the airplane, and the pallet was placed on skids that rode over the rollers. The load was lashed in place and an extraction parachute rigged for deployment. When the load was to be dropped, the extraction chute was deployed, which began to pull the load out of the aircraft. As the extraction chute pulled the load out, a set of knives cut the lashings that held the load in place. The extraction chute then pulled the load the rest of the way out of the aircraft, at which time it began to fall. As the load fell clear, the main parachutes would be deployed by static lines. This method kept the load lashed in place until it was about to leave the aircraft, making it much safer for use than the earlier system. It also allowed the pallet to drop in a more stable fashion. The Board tested this technique and found it to be fully satisfactory, and it has remained in use ever since.[24] In later years it also provided the inspiration for the development of other airdrop techniques such as the Low Altitude Parachute Extraction System (LAPES).

The first test of Heavy Drop conducted in 1947 used a 105mm howitzer and a jeep, mounted on the skate pallets. By 1950, the roller and skids technique had been perfected, and the Board demonstrated it to the 11th and the 82nd Airborne Divisions. They received it well, and the Board began to train them in it that summer.[25] They began to use it in exercises, and eventually in combat. For example, on 20 October 1950, the 187th Airborne Regimental Combat Team was dropped at Sukchon near Pyongyang. Air Force C-119s and C-47s delivered a total of 2,860 paratroopers and 301.2 tons of supplies and heavy equipment in a near perfect drop.[26] The 187th executed a second operation on 23 March 1951. C-46s and C-119s dropped 3,447

paratroopers and 219.5 tons of supplies and equipment. This jump also went smoothly.[27] Heavy Drop's final proof came in Exercise Swarmer in 1953, in which the 11th Airborne Division used Heavy Drop to deliver thirty-eight jeeps, eight 105mm howitzers, two 40mm anti-aircraft mounts, sixteen quarter-ton trailers, and 3,500 pounds of ammunition. Lashed to these loads were twenty-two .50 calibre machine guns, eight 4.2 inch mortars, twelve light machine guns, twenty-five reels of wire, and two jeep-mounted radars. All loads were delivered without mishap. The technique was so successful that the 11th Airborne did not feel it necessary to discuss the technique in its after action report.[28]

When the Korean War broke out at the end of June 1950, the Board's workload, including airborne testing, grew dramatically in response to its demands. In the first year of the war, the test load nearly doubled (89 tests assigned in 1950, 155 tests in 1951), but the Board received a personnel increase of only seven percent. The Board reorganized internally, redistributing its workload. It also streamlined the testing process by reducing the number of steps required. The combined result of this was to reduce by ten percent the time needed to complete a test. Further, in order to minimize distractions, it cut back on "extracurricular activities," such as demonstrations of airborne equipment to civilians and other military organizations.[29] The number of tests grew further in 1952, and stabilized only when the war ended in 1953.

Korea had shown the folly of subordinating the Boards to the local Army commanders, who were unable, or unwilling, to give them the attention required. Therefore, on 1 June 1953, the Boards reverted to the control of the Chief of Army Field Forces as Class II activities. The Board at Bragg now became Board #1, Office of the Chief of Army Field Forces (OCAFF).[30]

Over the years following 1945, the unification of the Boards had not proved entirely satisfactory, and some sections of Board #1 had been separated. The last of these splits occurred in 1954, when the Field Artillery and Aviation Test Divisions were separated from the Fort Bragg organization and formed as a separate Board. These retained the title of Board #1, and the Fort Bragg organization, including the Airborne Test Division and the Communication and Electronics Test Division, was renamed Board #5, OCAFF.[31]

The end of the Korean War and the Eisenhower Administration's decision to rely on "Massive Retaliation" soon brought new changes to the Army. On 1 February 1955, the Army was again reorganized, and the Office of the Chief of Army Field Forces became Continental Army Command (CONARC). The service boards remained under this jurisdiction and became CONARC Boards 1 through 5. Further

changes in designation followed in that year. With the establishment of CONARC, the Board at Fort Bragg became the 8576th DU, Board 5, CONARC. In August, this was changed to the 7105th SU, Board 5, CONARC. However, through all of these name changes, the organization and work of the Board remained essentially the same.[32]

In 1956, Congress instructed the Department of Defense, including the Department of the Army, to update its terminology, names, symbols, and designations. The name of Board #5 thus changed on 1 January 1957 to the U.S. Army Airborne and Electronics Board, and would remain so for the next several years.[33]

From 1950 through 1953, the Board's work was dominated by the needs of combat in Korea, although it tested other developments as well. The Board had established a policy of only accepting combat veterans after World War II. This trend continued after Korea. Many of the tests run in the years immediately following Korea were based on the combat experience of the test officers, some of whom came to the Board directly from combat assignments.[34] Higher headquarters also ordered tests based on its perceptions of Korean operations. Experience in Korea sparked a strong increase in interest in air mobility.[35] Finally, some new aircraft appeared during and after Korea that radically altered airborne capabilities.

The problem of delivering heavy equipment to airborne forces emerged very early. During World War II, this was solved by using gliders. A glider had a greater carrying capacity than a powered aircraft of the same size, was easier to load and unload than a powered aircraft, and could be loaded and held in reserve well before it was needed. A glider needed less special packaging and had a lower risk of damage than dropping bundles of equipment. Gliders could also land in a smaller area and rougher terrain than powered aircraft Finally, gliders were also relatively inexpensive and thus more expendable. There were drawbacks, however. They were essentially a one-shot delivery system. Once landed in combat, getting them back in the air was extremely difficult. Further, they were very vulnerable to both ground anti-aircraft fire and fighter aircraft.[36]

An outgrowth of the glider was the assault aircraft, basically a powered glider. Such a plane was conceived as an inexpensive, rugged, machine with a slow landing speed, capable of making repeated deliveries to an airhead.[37] During 1949, Board #1 conducted a series of tests to compare gliders and the assault aircraft for airborne operations. "It was determined that the assault aircraft was more suitable and economical."[38] The airframe the Board used in these tests was the XCG-20, a proposed glider for airborne use. With the rejection of the glider concept by the Board, the Air Force decided to try a new approach by adding engines to the same airframe. This

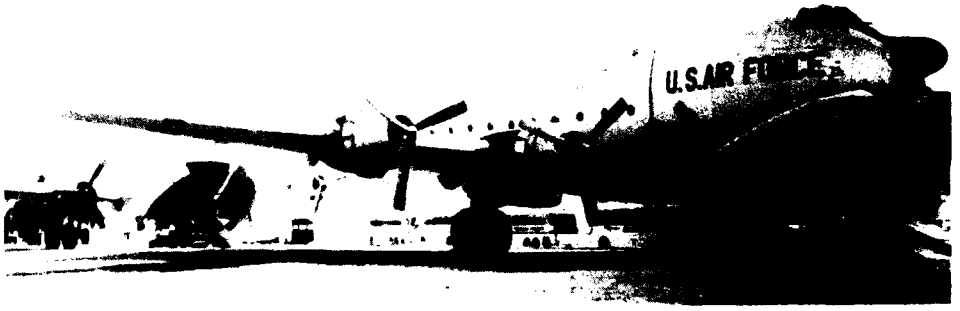
13. C-123B Aircraft. (*Airborne and Special Operations Test Board*)

airplane was accepted into the Air Force inventory as the C-123, and was tried in some air assault operations in the late 1950s. The Air Force found it to be too vulnerable, however, and relegated it to a logistical role in support of Air Force units.[39]

While this approach had faltered, the Air Force had tried another that was to change the face of airborne operations permanently. In 1951, the Tactical Air Command announced the specifications for a new transport aircraft intended

14. Dirt landing test of the C130B at Fort Sewart in 1959 Air Force Base, Tennessee in 1959. (*Airborne and Special Operations Test Board*)

specifically for airborne assault and aerial resupply missions. A contract was signed with Lockheed Aircraft in 1952, and by 1954, prototypes were operational. This plane was the C-130 Hercules, which is not only still in operation as the mainstay of airborne operations, but is still in production over thirty-five years after it initially reached service. Even the venerable DC-3 did not achieve that kind of record.



15. C-124C "Globemaster" on the taxiway in front of the Airborne, Electronic, and Special Warfare Board in 1969. (*Airborne and Special Operations Test Board*)

16. C-130s during Exotic Dancer VI at Pope Air Force Base in 1973. (*Airborne and Special Operations Test Board*)

The C-130 was a somewhat different design from the C-119 it replaced. Instead of clamshell rear loading doors, it had a ramp that could be lowered to truck-bed height or ground level, and could also be opened in flight for airdrop operations. It was larger internally and more powerful, capable of carrying double the payload of a C-119. It

also had greater range, higher speed, and better take-off characteristics than the earlier plane.[40]

The advent of the C-130 brought many changes to airborne operations. Its greater capacity and lifting ability gave the Army the chance to test airlift and airdrop techniques for most of its equipment, with the exception of medium and heavy tanks. During the late 1950s, the Quartermaster School developed rigging and drop procedures for this equipment, and the Board tested them. This led to an increase in Board activity in the late 1950s when the rest of the Army was going through a period of recession. In 1960, the Board ran nearly 100 tests, the vast majority related to air-dropping heavy equipment.

17. C-130E performs LAPE of M551 on Sicily drop zone (DZ) at Fort Bragg in 1981. (*Airborne and Special Operations Test Board*)

Another change came even before the C-130 appeared. The C-119 was much faster than the C-47 or the C-82. Paratroopers jumping from this airplane with the old T-7 parachute experienced unpleasantly violent opening shocks. This was due to the opening sequence in which the canopy deployed first, and then the suspension lines. The T-7 had several other problems directly related to this. Sometimes suspension lines would cross over canopy panels, burning them. These panels often burst under pressure, reducing the drag area of the parachute, resulting in a faster rate of descent, harder impact with the ground, and a higher risk of injuries.

The T-10 was developed by the Air Force in the late 1940s and was tested by the Board for Army use. It used a new opening sequence developed by the British in which the parachute was packed inside a second bag. When the canopy was to be deployed, the parachute would leave the pack but not open until the suspension lines had deployed to their full length. At that point, they would break open the second pack

allowing the canopy to deploy. This resulted in a much reduced opening shock for the paratrooper than was experienced with the T-7. Further, the new sequence reduced the possibility of suspension lines burning panels out.

18. The T-10 personnel parachute with a 1950 weapons container and aviator's kit bag rigged in an H-harness. (*Airborne and Special Operations Test Board*)

The T-10 had other benefits over the T-7. It was larger (thirty-five feet in diameter as opposed to twenty-eight feet for the T-7). This allowed the T-10 to support more weight, or to drop its load more slowly. The porosity of the canopy had been altered to slow descent, and the opening in the apex of the canopy was also modified for this reason. The T-10 also had a different geometry than the T-7. It was parabolic so that two parachutes that passed close to one another would repel each other. The T-7s simple geometry tended to draw two parachutes together, and they generally became

entangled when they touched, endangering both paratroopers. Finally, the T-10 was more stable than the T-7, with a reduced tendency to oscillate (swing the parachutist from side to side).

19. A portion of the cover photograph: Airdrop using T-10B parachutes with ALICE on the lowering line. (*Airborne and Special Operations Test Board*)

The Board tested the T-10 through the early 1950s. Completing this process took ten thousand troop jumps, and was not without its dangers. Prior to the T-10, the Board had been testing the T-9, which, among other things, moved the reserve parachute from the jumper's chest to his back, just below the main chute. During one jump, a British liaison officer's canopy malfunctioned, his chute wrapping around him. This prevented him from deploying his reserve chute, and he was killed. Since no relatives could be located in Great Britain, he was buried at Fort Bragg.[41]

The Board approved the T-10 and the Army adopted it as standard in 1953. For the most part, airborne troopers found the T-10 to be superior to the T-7 and liked it,

although a few felt that it was too easy on the troops. It has since been modified slightly, but has remained the standard troop parachute for the airborne ever since.[42]

The Army conducted another major program in the late 1950s to evaluate all contemporary civilian transport aircraft for military use, including airborne. This project was born out of a concern that the Air Force might not have enough airlift capacity available to fill Army needs. In general, these aircraft were found to be suitable for personnel transport and even cargo transport. Generally, they were unsuitable for airdrop, however, and the Board recommended that they be used for troop jumps only in the most pressing situations. The Board also tested several other Air Force military transports, but generally found them to be unsuitable for airdrop of materiel.

The period between 1945 and 1962 was one of frustration and difficulty for the Army as a whole. The Airborne Board shared in much of that frustration, losing its identity, and then slowly gaining it back. However, it was also a time of fertile growth and development for airborne techniques. By 1962, most of the techniques and equipment in use today had already appeared in some form, been tested, and refined. The Board participated fully in this development and was in a strong position to contribute to the development of the Army.

NOTES

[1]HQ, U.S. Army Test and Evaluation Command, "Historical Summary of U.S. Army Service Testing", p. 5 (Hereinafter, "Hist. Sum. Ser. Test."), p. 10.

[2]History of Army Ground Forces Board #1, Volume 1 (Hereinafter, Hist. AGF Bd. #1, vol. 1), p. 19, Historical Files, TEXCOM Airborne and Special Operations Test Board, Fort Bragg, N. C..

[3]Ltr, HQ, AGF, 334/127(R) (22 Sept 45) GNRQT-/40352, 22 September 1945, (Appendix to Hist. AGF Bd. #1, vol. 1, p. 111).

[4]The Coast Defense Artillery Service Test Section was located at Fort Monroe, Virginia. The Air Defense Artillery Service Test Section was stationed at Fort Bliss, Texas. The Ground Aircraft Service Test Section, which tested and evaluated Army Ground Forces aircraft was located at Eglin Field, Florida. Board #2 was located at Fort Knox and was responsible for testing transportation equipment, including trucks, landing craft, animals, and tank equipment, including anti-tank guns. Board #3 was formed at Fort Benning to test personal equipment and man-portable weaponry. Hist. AGF Bd. #1, vol. 1, pp. 18-20; "Hist. Sum. Ser. Testing", pp. 11-12.

[5]AGF 334.127(R); also, Ltr, HQ, AGF, 334/1(AGFBd#1)(R) (4 October 1945) GNRQT/41926, 4 October 1945, Appendix to Hist. AGF Bd. #1, vol. 1, p. 112.

[6]Hist. AGF Bd. #1, vol. 1, p. 33.

[7]Ibid., p. 47.

[8]Ibid, pp. 67, 82.

[9]Ibid., p. 107; History of Army Field Forces Board #1, Vol. 2 (Hereinafter Hist. AFF Bd. #1, vol. 2). While the name of the Board changed several times between 1945 and 1955, the histories of the Board written in these years were numbered sequentially through Volume 5. After that, the Board stopped writing histories for several years); "Hist. Sum. Ser. Testing", p. 10.

[10]Hist. AFF Bd. #1, vol. 2, p. 3; "Hist. Sum. Ser. Testing", p. 13.

[11]Ibid.

[12]William H. Piefer, Supply by Sky: The Quartermaster Airborne Development, 1950-1953, QMC Historical Studies, Series II, Number 2 (Washington, D.C.: Historical Branch, Office of the Quartermaster General, 1957), p. 2-5, 333.

[13]Ibid., p. 4.

[14]Hist. AGF Bd. #1, vol. 1, p. 59; Report of Army Ground Forces Board #1, Project # XAB 294, "C-82 Airplane", 19 April 1946.

[15]Hist. AGF Bd. #1, vol. 1, pp. 59, 75-76.

[16]Report of Army Field Forces Board #1, Project # AB 649, "Service Test of C-119B Aircraft," 6 December 1950; Jane's All the World's Aircraft, 1951-1952 (London: Jane's , 1951), p. 234c.

[17]Hist. AGF Bd. #1, vol. 1, pp. 48, 62, 87; Hist. AFF Bd. #1, vol. 2, pp. 19, 23; "Hist. Sum. Ser. Testing, p. 13.

[18]Army Field Forces, Final Report of Army Field Forces Board #1, Project # AB749, "Heavy Drop", 26 March 1953.

[19]Ibid.; Ltr, HQ, AGF Bd #1 (400.302 GNBAB) 25 April 1947.

[20]The Gamma Goat, however, is compatible with Low Velocity Airdrop. It cannot be dropped from higher altitudes.

[21]Peter E. Kelley, "Letter Report, Rigging Procedures for Airdrop of Truck, 1 1/4 - Ton, 6x6, M-561, and M-792, TECOM Project No. 4-CO-60A-000-002 (AB 272)," US Army Airborne, Communications and Electronics Board, Fort Bragg, North Carolina, 2 March 1972, pp. 1-3.

[22]Record of historian's telephone interview with Mr. Hank Antkowiak, cargo parachute specialist, Natick Army Laboratory, 11 June 1990.

[23]Ibid.

[24]Ibid.; Hist. AFF Bd. #1, vol. 1, pp. 91, 93.

[25]Hist. AFF Bd. #1, vol. 2, p. 18.

[26]Robert F. Futrell, The United States Air Force in Korea, 1950-53 rev. ed. (Washington, D.C.: Office of Air Force History, 1983), pp. 208-211.

[27]Ibid., pp. 352-354.

[28]HQ, 11th Airborne Division, After Action Report, Exercise Swarmer, April/May 1953.

[29]History of Army Field Forces Board #1, Volume 3 (Hereinafter, Hist. AFF Bd. #1, vol. 3), p. 2.

[30]History of Army Field Forces Board #1, Volume 5 (Hereinafter, Hist. AFF Bd. #1, vol. 5), p. 1; "Hist. Sum. Ser. Testing", p. 15.

[31]Hist. AFF Bd. #1, vol. 5, p. 1; "Hist. Sum. Ser. Testing", p. 16.

[32]History of Board #5, CONARC, Volume 6 (Hereinafter, Hist. Bd. #5, CONARC, vol. 6), p. 1; "Hist. Sum. Ser. Testing", p. 16.

[33]"Hist. Sum. Ser. Testing", pp. 16, 18-19.

[34]Historian's notes, telephone interview with BG (Ret.) Bertram K. Gorwitz (test officer, AFF Board #1, 1951-1954), 3 July 1990 (hereinafter, Gorwitz interview).

[35]Ibid., pp. 14-15.

[36]Peifer, Supply By Sky, p. 4.

[37]Ray L. Bowers, The United States Air Force in Southeast Asia: Tactical Airlift (Washington, D.C.: Office of Air Force History, 1983), p. 29.

[38]Report of AFF Bd. #1, Projects Numbered AB 2050, CE 3950, AC 1050, FA 2050, 29 December 1950, p. 1F8.

[39]Bowers, Tactical Airlift, p. 29.

[40]Jane's All the World's Aircraft, 1954-55 (London: Jane's, 1954), p. 260; Jane's All the World's Aircraft, 1963-64 (London: Jane's, 1963), p. 240; Bowers, Tactical Airlift, p. 33.

[41]Gorwitz interview.

[42]Historian's record, telephone interview with Mr. Ed Giebutowski, personnel parachute specialist, Natick Army Laboratory, 11 June 1990 (Hereinafter Giebutowski Interview); historian's record, telephone interview with BG(Ret.) Bertram K. Gorwitz, (test officer at AFF BD #1, 1951-1954); Peifer, Supply By Sky, pp. 295-300.

CHAPTER III
THE BOARD UNDER TECOM

The Vietnam era corresponded almost exactly with the Board's tenure under Test and Evaluation Command (TECOM). The period began with the Presidency of John F. Kennedy. With him came the "Whiz Kids," a group of young, ambitious, highly educated men who intended to reform the military. One of the most important targets of their reforms was the test and evaluation of new equipment. Another was the structure of the armed forces itself.

As recounted in Chapter I, new equipment had to go through a specific testing cycle before being accepted for Army use. On the eve of World War II, a specific order to this cycle had been established. First came engineering testing, to ensure that the equipment was safe to use and could do what was expected of it. Also part of this phase was testing for reliability, availability, and maintainability (now referred to as RAM). Once the engineering testing, also known as developmental testing, had been completed, the next phase of service testing could begin. This was the phase that the Airborne Board, like other service boards, had been established to accomplish. Service testing ensured that combat troops could use the equipment in question under field conditions. Some measurement of RAM was also a part of this phase as well. Sometimes, a further phase of service testing, called troop testing, was done. In this phase, a limited quantity of the equipment under test was distributed to combat troops for use under field conditions. The Army Ground Forces, Army Field Forces, and CONARC, the various headquarters commanding user troops, generally preferred troop testing before finally accepting a piece of equipment.

This process could be cumbersome and time consuming. The services of supply, in particular, found it frustrating because the user often rejected or restricted equipment because it did not meet their standards for unrestricted field use. Further, during the second world war, the need to get new equipment into the hands of combat troops was very pressing. Therefore, the Army tried to combine both phases. Unfortunately, this did not work out. The service boards did not have the resources to execute technical testing, while the technical service did not have the combat expertise to do user testing. However, "[a]n AGF historian concluded after the war that neither engineering nor service testing could be dispensed with, but the testing process might have been greatly simplified under more integrated development agencies."[1]

Testing was a major target of the reforms brought about by the Kennedy administration. The Army formed an "Ad Hoc Committee on Army Materiel Testing", also

known as the Duda Committee, after its chairman. The Duda Committee concluded that too many resources were tied down in testing, that testing was inefficient, that service and developmental (engineering) testing often duplicated each other, that testing was done badly, that the tests often failed actually to test the equipment, and that the recommendations resulting from tests were often not incorporated into production models.[2]

As a result of this report, the Army decided to form one organization to oversee and coordinate both developmental and service testing, TECOM. Because testing was part of the materiel acquisition process, TECOM in turn became a part of the Army Materiel Command. TECOM attempted to assign tests to its subcomponents in such a way that technical testing contributed to the user's understanding of new equipment and that service testing contributed to the technical evaluation of it.

Therefore, on 1 August 1962, the Airborne and Electronics Board was reassigned from CONARC to TECOM. Its mission changed little, however. User testing remained the first priority. The next priority was to participate in technical testing as assigned by TECOM Headquarters. Troop testing and guidance to developing agencies rounded out the Board's priorities.[3]

Reassignment to TECOM was not the only change the Kennedy administration brought to the Board. In response to the spread of Marxist-lead wars of national liberation in the Third World, the Kennedy administration espoused the "special warfare" concept. The Special Forces, or Green Berets, was the newly forged tool of this policy. Since such troops were often airborne trained, and were also headquartered at Fort Bragg, the Airborne and Electronics Board became their service board as well. Hence, in January 1962, the Board's name was changed to Airborne, Electronics, and Special Warfare Board.

The assignment of special warfare testing increased the Board's responsibilities, but these were, unfortunately, not at all clear. The statement of Board responsibilities and the actual work that they did were very different. For instance, in the airborne field, the Board was responsible for testing airdrop kits, and the rigging techniques and air transport procedures for Army equipment that were developed by the Natick Laboratories, the Quartermaster School and the Transportation School. In practice, the Board often found these techniques wanting, and developed many of the final techniques itself.[4] Another problem was that the user often sent the Board items to be tested without telling the Board what requirements it was supposed to fulfill.[5]

In the special warfare arena things were equally complicated. Initially, the Board's responsibility in this field was limited to equipment intended exclusively for special warfare. Only psychological warfare equipment was exclusive to special warfare, however.

Special warfare agencies often requested tests of the Board that were subsequently assumed by other agencies because of the nature of the equipment, though the Board attempted at least to participate in such tests. However, the Board found itself losing considerable time and wasting valuable resources planning tests that were then taken away from it.[6] This was eventually resolved through a new TECOM regulation that removed the exclusivity requirement for special warfare testing. Now, the Board was allowed to test "equipment primarily for use in special warfare."[7]

Vietnam was, of course, the dominant issue from the mid- 1960s to the early 1970s, and the Board's workload reflected this. Over 90 percent of the tests conducted between 1962 and 1967 were directly related to experience or requirements for Vietnam.[8] Delivery of supplies and other needs to the combat area quickly, with minimal risk from anti-aircraft fire, and minimal damage to the load, was one of the more important requirements of this period.

The improvement of anti-aircraft weaponry in the late 1950s led to increased risk to slow-moving transport aircraft. Further, there were rarely viable landing sites within combat areas. Therefore, even at that time, the Army was looking at low altitude delivery methods. Between the Army and the Air Force, several were developed in these years.

One of the early systems was the Container Delivery System (CDS). This system had already been used during Korea, and was adapted to subsequent aircraft. In this system, the loads of up to one ton were rigged in canvas containers and placed on plywood platforms. When the time came for delivery, the rear cargo door of the airplane was lowered, the pilot raised the nose eight degrees and added power. A release parachute cut the load restraint, and gravity drew the load out of the aircraft. The parachute then stabilized the load while it dropped. Loads of up to one ton could be delivered from as high as six-hundred feet. A C-130 could carry up to sixteen packages rigged for CDS.[9]

Another method was the Parachute Low Altitude Air Delivery System (PLADS), which was used for precision delivery of small packages by the C-130 at altitudes of about two hundred fifty feet. Later, the missions for which this was used were taken over by the CV-2 Caribou.[10] Another delivery system for heavier loads was the Low Altitude Airdrop System (LAADS), which could be used to drop loads of between 2,500 and 3,750 pounds.[11] These systems were not effective for delivering larger loads, however. The Army and Air Force thus cooperated to develop other techniques for delivering equipment from much closer to the ground.

The first of these was the Ground Parachute Extraction System (GPES), which closely resembled the arrester system used on aircraft carriers. In this case, a hook was affixed to the load pallet. During delivery, the aircraft would fly low over the delivery area

with the hook deployed over the rear cargo door. A wire was stretched across the delivery area perpendicular to the line of flight. The hook on the cargo pallet would grab this line, which then extracted the load. This system was supposed to permit precision delivery of heavy loads. Unfortunately, it had several drawbacks. It required the ground equipment to already be in place to work, and platform recovery was difficult. The Board also found it unreliable and hazardous to use.[12]

20. C-130E performing a Container Delivery System Drop. (*Airborne and Special Operations Test Board*)

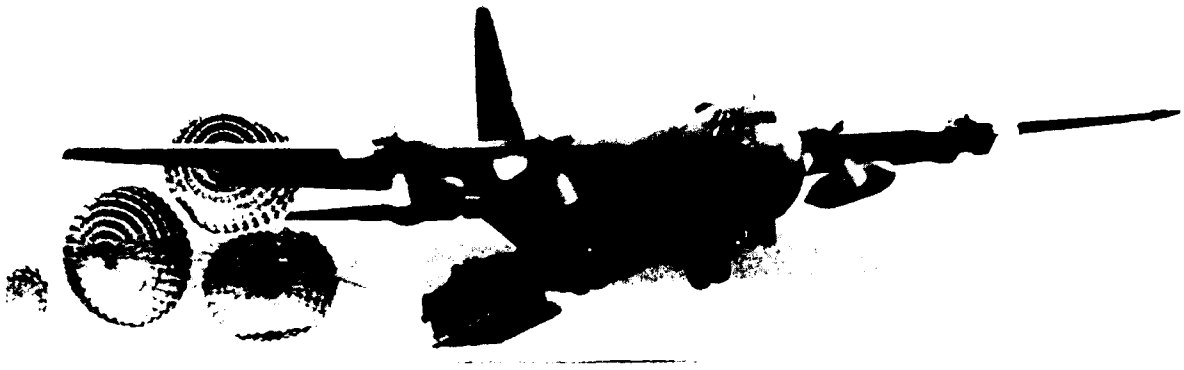
The most successful of the systems had its roots in the Quartermaster School in 1962. This system, which the Army referred to as LOLEX (Low Level Extraction System), used a parachute to extract the load from an aircraft flying close to the ground at a low speed. The Air Force tested a similar system at Eglin Air Force Base, Florida, in 1964,

calling it the Low Altitude Parachute Extraction System (LAPES), by which it is still known. This proved to be the most successful development of the period. The technique is a simple modification of the heavy drop techniques, with some repositioning of the shock-absorbing material. Initially it proved to be unpopular with aircrews in Vietnam because it required much training time. After Vietnam, however, LAPES became a standard delivery system, and remains in use today.[13]

The Board also tested several important new personnel parachutes and jump techniques. The first of these was the steerable T-10, which was developed by cutting slots in the back of the canopy. The shape of these slots can be manipulated to maneuver the parachutist, and the slots also give a slight degree of forward thrust. The board then tested the MC-1 with an oval cut and sliprisers. This line of development led to the even more sophisticated MC-1-1. Later, the Board also tested ram-air canopies, such as are used by sport parachutists. Generally, however, steerable canopies are used by special operations forces and not in assault drops because of the possibility of accident.

Two very important jump techniques developed and tested at this time were HALO (High Altitude [jump], Low Opening) and HAHO (High Altitude [jump], High Opening). HALO was developed because the Army needed an accurate method of delivering special forces personnel and equipment with minimal opportunity for them to be detected. The soldier would jump from 20,000 to 30,000 feet and free-fall until 2,000-4,000 feet from the ground, at which time he would open his parachute. Equipment was fitted with an altimeter that would deploy the parachute at the appropriate time. The canopy was one of the new steerable types. HALO can be used in special situations, but the altitudes from which jumps are made with this technique are also those at which air defense missiles are the most effective. The Board found the technique very questionable.[14] HAHO, or High Altitude, High Opening, was similar, except that the parachutist deployed his canopy while still at a high altitude. Using a steerable canopy, and with a wind in the right direction, the jumper can travel fifteen or more miles from where he jumped before he lands. However, in addition to the increased risk from air defense missiles, the HAHO technique allows a much greater chance for the jumper to be detected.[15] Both techniques are limited to use by special operations forces. Conventional assault forces are dropped at low altitude, as quickly as practicable, to minimize dispersion, consolidate quickly, and limit mishaps as much as possible.

Two new transports emerged during the Board's tenure under TECOM. In 1960, the Air Force began searching for a replacement for the C-124 for global strategic airlift. The Air Force also wanted to take advantage of the speed increases available with jet engines. It first published the requirements for the new aircraft in 1960. By mid-1962,



21. C-130E executing a LAPE of a 5 ton truck over Sicily DZ at Fort Bragg in 1984. (*Airborne and Special Operations Test Board*)

22. Three candidates for the Interim Ram Air Parachute System (IRAPS). The Paraflite test system in the center was selected and is now in use as the MC-4 freefall system. The other candidates tested were the Strong Enterprises system on the left and the Pioneer system on the right. (*Airborne and Special Operations Test Board*)

23. An M-48 Tank being loaded into a C-5 aircraft. (*Airborne and Special Operations Test Board*)

Lockheed-Georgia had won the competition for the design. Test prototypes of the airplane, designated the C-141 Starlifter, were ready by 1965 and it was in service by 1967. While designed as a strategic transport, the original specifications called for some tactical capability, including airdrop and troop jumping, as well. This requirement was later dropped and then reinstated. The Board tested and certified the aircraft for troop jumps, and tested the rigging techniques developed for the loads by the Quartermaster School.

This brings up a curious point. While aircraft performance has increased substantially since the C-47 of World War II, airdrops and jumps are still done from relatively high altitudes and slow speeds. Most assault drops today are done from heights of about 500 to 1,000 feet at speeds of between 120-130 knots. This is due more to limitations on the stress on the airframe than to those on the troops, although that is important as well. Part of the reason for the replacement of the T-7 by the T-10 in the mid-

1950s was that the stresses of jumping at higher airspeeds were too great on the T-7 parachute. Work is proceeding today (1990) at Natick Army Laboratory to permit jumps at greater speeds, up to 250 knots, and lower altitudes, about 300 feet. This is proceeding very slowly, however.[16]

The C-5 program began in 1962 when the Air Force decided it wanted an aircraft capable of lifting very heavy or outsized cargo, such as ballistic missiles. The C-5 was also to have a rough field capability so it could support some tactical operations. This later disappeared due to cost and other limitations. The C-5 was designed with the capability of performing airdrops and troop jumps, however, problems with the wings prevented completion of this certification until 1989. The Board did certify the internal air transportation rigging for the C-5, however, and began the jump and heavy drop testing.

24. An M551 under recovery parachutes. (*Airborne and Special Operations Test Board*)

The C-5 program began in 1969, and was halted in 1973 with most of the test work completed. The program was resumed and brought to a conclusion in 1988. Following the end of testing, a world heavy drop record was established on 7 June 1989 by the Airlift Center at Pope Air Force Base in conjunction with the 82nd Airborne Division and with the technical support of the Board (now called the Airborne and Special Operations Test Board). This record drop from one C-5 aircraft totaled 190,493 pounds and included four combat equipped M551 Sheridans (168,000 pounds) and 73 combat equipped troops.

As the struggle in Vietnam proceeded, the Army changed its emphasis from special operations forces to conventional forces. These eventually bore the brunt of the fighting, and the Army's interest in special warfare waned. In 1970, the Board's name was again changed to reflect this, becoming the Airborne, Communications, and Electronics Board (ACE Board). The change in name brought little change in function or organization, however. The Board remained in this configuration until 1973, when the end of the Vietnam War again brought great change to the Army as a whole.

NOTES

[1]HQ, U.S. Army Test and Evaluation Command, "Historical Summary of U.S. Army Service Testing", p. 5 (Hereinafter, "Hist. Sum. Ser. Test."), p. 10; see also pp. 7-9.

[2]"Report of Ad Hoc Committee on Army Materiel Testing" ("Duda Committee"), February, 1962 (Hereinafter, "Duda Report"), p. 1.

[3]Airborne, Electronics and Special Warfare Board, Special Historical Summary, August 1962-1963, p. 2.

[4]Airborne, Electronics and Special Warfare Board, Special Historical Summary, August 1962-July 1963, pp. 2-3; see also interviews with Dexter Hall and Paul Sutton, TEXCOM Command Historical Office.

[5]Sp. Hist. Sum. Aug 62-Jul 63, p. 4.

[6]Ibid., p. 3.

[7]Airborne, Electronics and Special Warfare Board, Special Historical Summary, July 1963-September 1963, p. 2.

[8]"Historical Activities", 1969, p. 5.

[9]Ray L. Bowers, The United States Air Force in Southeast Asia: Tactical Airlift (Washington, D.C.: Office of Air Force History, 1983), p. 259.

[10]Ibid.; see also PLADS Test Report, pp. 1-3 for discussion of the system.

[11]LAADS Test Report, pp. 1-4 for discussion of the system.

[12]Bowers, Tactical Airlift, p. 143; LOLEX Report, p. 2.

[13]LOLEX Test Report, pp. 1-2; Bowers, Tactical Airlift, pp. 143, 259.

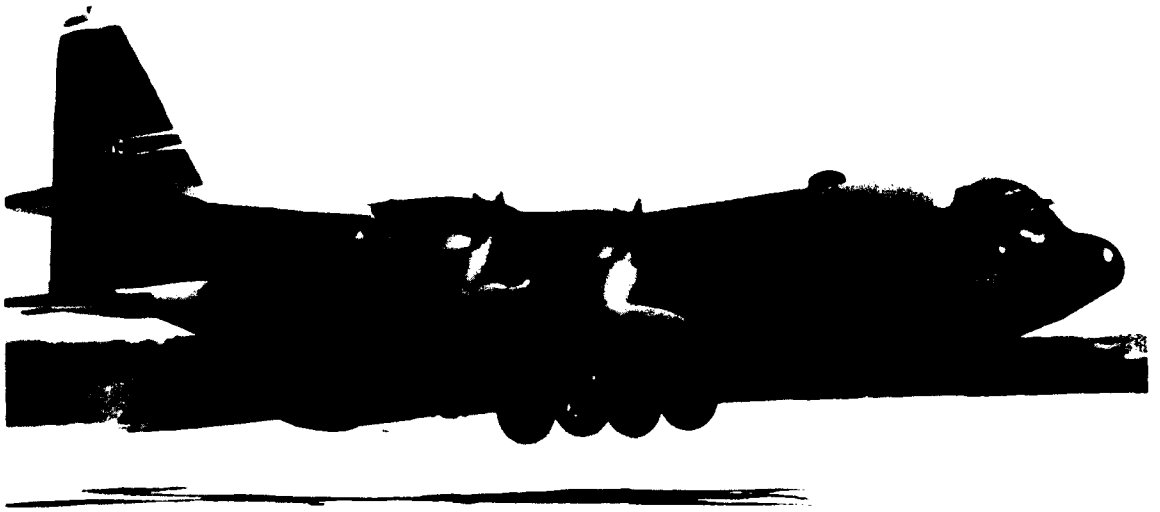
[14]HALO Report, pp. 2, 4; Giebutowski interview.

[15]Giebutowski interview.

[16]Ibid.

CHAPTER IV
THE BOARD IN THE PRESENT ERA

The end of the Vietnam conflict, and the Army's conduct in it, resulted in an examination of the Army's structure and performance in light of that war. CONARC was found to be wanting in this light, and the Army again reorganized. Forces Command (FORSCOM) was formed to command and control active combat units charged with maintaining unit training and readiness. The U. S. Army Training and Doctrine Command (TRADOC) was formed to perform individual training, to examine Army doctrine, and to develop new doctrine if necessary. Part of this task was developing the requirements for new equipment.



25. A C-130E performing a LAPE of a M551 Sheridan on Sicily DZ, Fort Bragg in 1976. (*Airborne and Special Operations Test Board*)

The Army also examined the acquisition process again, forming the Army Materiel Acquisition Review Committee (AMARC) to examine how the Army should adapt in light of the changes coming after disengagement from Vietnam. AMARC projected that the fiscal picture would change drastically. Budgets would shrink, both relatively and in real terms. Less money would be available for research and development. AMARC also foresaw a change in the character of the American soldier as the draft ended to be replaced by the All-Volunteer Force (AVF). The average ability of the AVF as a whole would not differ greatly from that of the draft era Army, AMARC predicted, but there would be a lower percentage of above average soldiers entering the Army for the foreseeable future.

26. A C-130E "in the dirt" on Sicily DZ, Fort Bragg in 1981. (*Airborne and Special Operations Test Board*)

The AMARC also examined testing and its relation to the acquisition process. Contrary to the decision of the Duda Committee (See Chapter III), AMARC decided the differences between developmental testing and user testing should be stressed because each had such a different emphasis. It recommended that testing again be split; technical testing should remain with AMC, but operational testing should become the responsibility of TRADOC and the Operational Test and Evaluation Agency (OTEA). In order to give TRADOC the capability to execute such testing, AMARC recommended that the Mobile Army Selected Systems Test, Evaluation, and Review (MASSTER) be reassigned from FORSCOM to TRADOC, and that the old service boards that had been assigned from CONARC to TECOM also be transferred to TRADOC.[1]

This reassignment finally took place on 1 July 1975, when the ACE Board was transferred from TECOM to TRADOC. While it did reorganize internally at the time, the change was otherwise very minor. The Board's mission remained basically the same: to test new airborne equipment and new rigging procedures for internal and external air transport of equipment.

The next major change to the Board had little impact on airborne testing. In 1978, the electronics and communication responsibility of the Board was separated from the Fort Bragg organization and established as a new Communications and Electronics Board at Fort Gordon, Georgia. This simplified the work at Fort Bragg by removing the distraction of testing electronics and communication equipment, though it did bring a new level of

exposure to the Board's airborne work, which previously had often been overshadowed by the communications and electronic work. Otherwise, this had little impact on the Board's airborne work, although the Board reverted to the name it had first had in 1944, the Airborne Board.

TRADOC's oversight of testing was not organized for many years. In 1984, TRADOC remedied this situation by appointing the commander of the TRADOC Combined Arms Test Activity (TCATA, a further development of MASSTER) as the Deputy Chief of Staff for Testing and Evaluation (DCST&E), and gave him some oversight and responsibility over the TRADOC Boards and the Combat Developments Experimentation Center. Coordination of testing was to be accomplished by the Combined Arms Center, Fort Leavenworth. About the only real change that resulted from this was that test plans now had to be approved by the DCST&E, who often demanded quantified data. In practice, he had little actual control over the Board, which continued to function as before.

At the same time, the Board was again redesignated. Interest in special operations had revived in the years since Vietnam, and the Board was again assigned responsibility for testing special operations equipment and techniques and a supporting role to training, exercises, and contingency operations. The Board was again renamed to incorporate this new responsibility, becoming the Airborne and Special Operations Test Board.

The most recent change to effect the Board was a further consolidation of TRADOC testing responsibility. The appointment of the DCST&E had not been as successful as some hoped, and MG Robert L. Drudik, who held the post, hoped to rationalize testing and its administration by establishing a command dedicated to that role within TRADOC. The formation of such a command would also resolve numerous disputes over who controlled and held responsibility for testing. In practice, the Boards tended to respond more to the local school commandants than to the DCST&E, a situation MG Drudik wished to correct. In 1987, this became a reality when a provisional Test and Experimentation Command (TEXCOM (P)) was formed. On 1 October 1988, TEXCOM became a permanent command within TRADOC, and the Board officially became the TEXCOM Airborne and Special Operations Test Board.

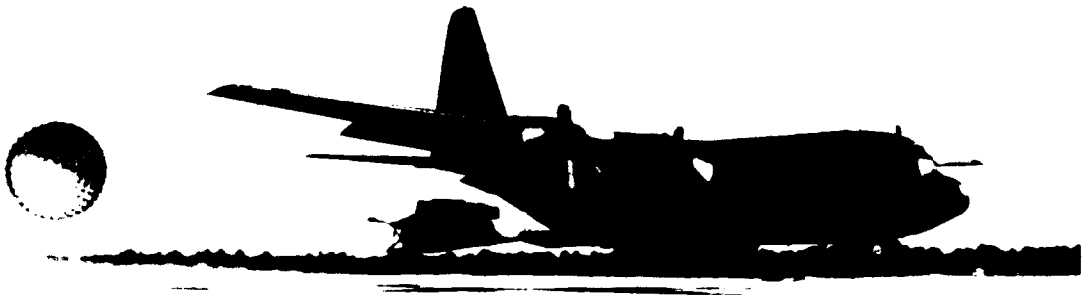
Since Vietnam, most changes in equipment have been incremental, evolutionary rather than revolutionary. The emergence of the light division in the mid-1980s did bring a new concern with air transportability of supplies, however. The light divisions are expected to operate in "austere" environments, away from normal lines of communication. The local population is expected to give little, if any support, and might often be hostile to the

American forces.[2] Some of the developmental work done in the airborne field in the 1980s has been focussed on methods to support the light division.

The extreme vulnerability of valuable transport aircraft continues to be a concern to the airborne, as does the problem of dispersion, and the Army is developing methods to address both problems. In addition, a replacement for the venerable C-130 is under development. The Army wishes to take advantage of the capabilities of this new aircraft, the C-17, which will include a vastly increased capacity for airdrops. The Airborne and Special Operations Test Board is the designated Army test organization for this aircraft.

One of the projects under development to make use of this plane is to increase the load capacity of the various drop systems, including both airdrop and low altitude parachute extraction (LAPE). The Army has approached this in an incremental manner. In 1984, the capacity for both airdrop and LAPE was 35,000 pounds. As a mid-way point between this and the target of 60,000 pounds, the Army set the first phase of development to reach a capability of 47,000 pounds. In 1984 and 1985, using upgraded standard airdrop components, the Army successfully tested and then approved a system capable of airdropping and performing a low altitude parachute extraction of 42,000 pounds, the rigged combat weight of the Sheridan light tank. Initial work on the 60,000 pound airdrop system has begun and will include new cargo and extraction parachutes and heavier suspension material.[3]

Another technology that has been tested, approved, but not fielded is the Airdrop Controlled Exit System (ACES). This is a series of "interconnected platforms with a hydraulic dampening device at each connecting point to restrict platform movement during descent."[4] Up to four platforms can currently be linked. ACES was developed to reduce



27. An HMMWV being extracted from a C-130 cargo aircraft using a 28 ft. extraction parachute. (*Airborne and Special Operations Test Board*)

dispersion of loads during airdrops. Using ACES, a variety of connected loads can be dropped ready for use almost immediately upon touching down. For instance, a High Mobility Multi-purpose Wheeled Vehicle (HMMWV) and a Vulcan air defense gun can be dropped, each on a separate pallet, but in conjunction so they can be deployed immediately after landing. As part of the upgrade in load capacity, a 60,000 pound ACES is also to be developed.[5]

28. The Airdrop Controlled Exit System (ACES) being demonstrated by a C-141B aircraft dropping a three platform load. (*Airborne and Special Operations Test Board*)

Of course, long-standing desires are also being pursued. The airborne always want to jump or drop from lower altitudes and higher speeds. On 7 July 1988, an Army-Air Force agreement established the desire of the two services to drop from 300 feet at 250 knots air speed. Work is proceeding right now to reach these targets, though at the moment, these are only gleams in the eye of airborne personnel.

While the equipment that the Board tests has changed incrementally, that is not true of the instrumentation the Board uses to gather data in the tests, which has improved by leaps and bounds in recent years and has brought corresponding improvements in methodology.

The Board's methodology for many years was very rudimentary, as was instrumentation. For instance, the rate of fall at touchdown was measured by tying a one hundred foot length of cord with a lead weight to the jumper or load. A data collector would time the period between the weight and the load touching the ground. Using this time measurement, the rate of fall could be calculated. Other instrumentation was only slightly more sophisticated.

In 1978, several new technologies became available that revolutionized airborne testing. A computerized cine-theodolite was developed that could be used to optically track and record data on loads as they were dropped. A radio telemetry system also appeared that would be used to measure the shocks and strains on the parachutist or load during a drop. This new equipment made it possible to record and quantify data on drops and jumps. There have since been two more generations of instrumentation, each with greater capabilities than the last.

With the advent of instrumentation that could record quantified data, the demand for it grew. TRADOC and OTEA required data in quantifiable form as much as possible. Further, as they became more familiar with it, some officers began to prefer quantified data, though many others still wanted to go with the older, less sophisticated methods. The resistance of these officers was overcome, however, by the demands of higher headquarters that data be in a more quantifiable, provable form. Hence, the methodology of airborne testing has changed to incorporate this quantified data, becoming more accurate and sophisticated, but also more complex.[6] It will become more so in the future, as instrumentation becomes even more capable and sophisticated.

As this is written, yet another organizational change is imminent. Operational testing is again being streamlined. An operational test command, analogous to TECOM's role in the technical test arena, is being formed from TEXCOM and OTEA. Again the Board's affiliation will change, but if history is any guide, its work will continue along the same lines that have been established from the beginning.

NOTES

[1]Precis to Report of the Army Materiel Acquisition Review Committee, 1 April 1974, pp. 1, 6, 7, 22. Note a curious course of events here. In 1962, at the beginning of a period of budgetary expansion, testing was consolidated. In 1974, at the beginning of a period of budgetary recession, testing was decentralized. One would usually expect the reverse to be true.

[2]Steven E. Anders and J. Britt McCarley, "U.S. Army Quartermaster Center and School Annual Historical Review, 1 January 1984-31 December 1986" (Fort Lee, Virginia, May 1988), p. 89.

[3]Ibid., pp. 93-94. [Editor's note: Thanks are due to Mr. Charles Peeler for his improvements to this passage.]

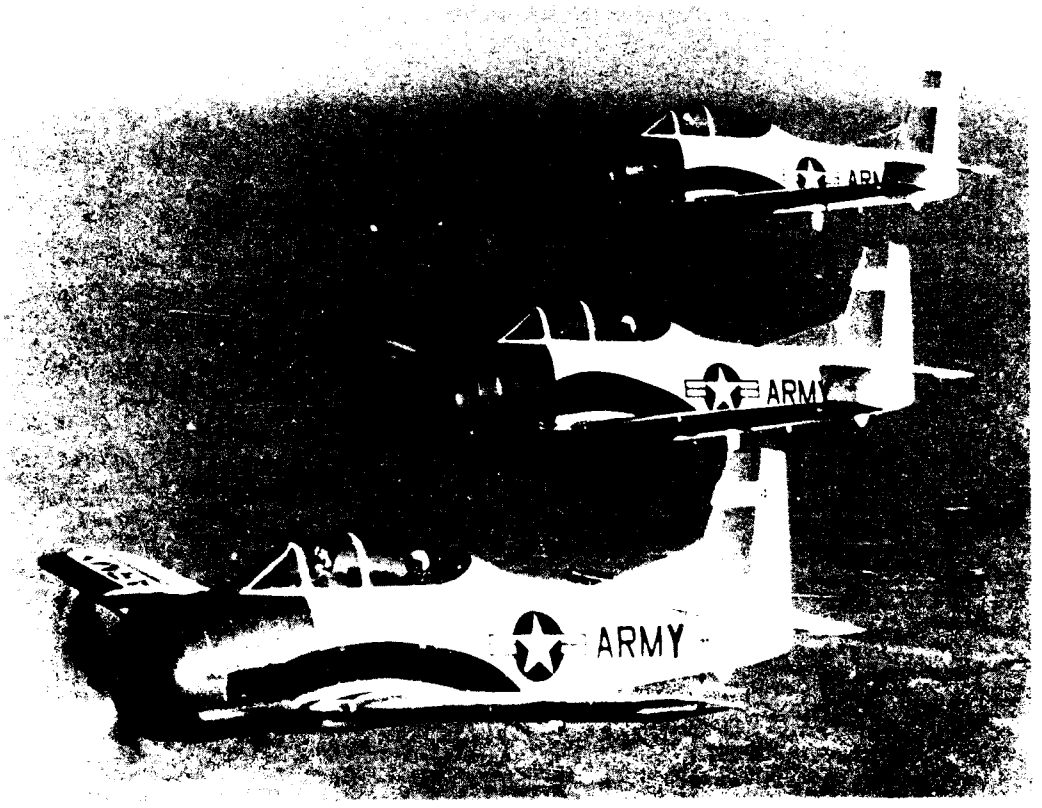
[4]Ibid, p. 92.

[5]Ibid.; see also, Norm Bruneau, "Airdrop Developments", Quartermaster Professional Bulletin, June 1988, p. 16.

[6]Historian's notes, telephone interview with Mr. Jim Lee, Instrumentation Manager, TEXCOM Airborne and Special Operations Test Board, 29 June 1990.

PHOTO-CHASE AIRCRAFT

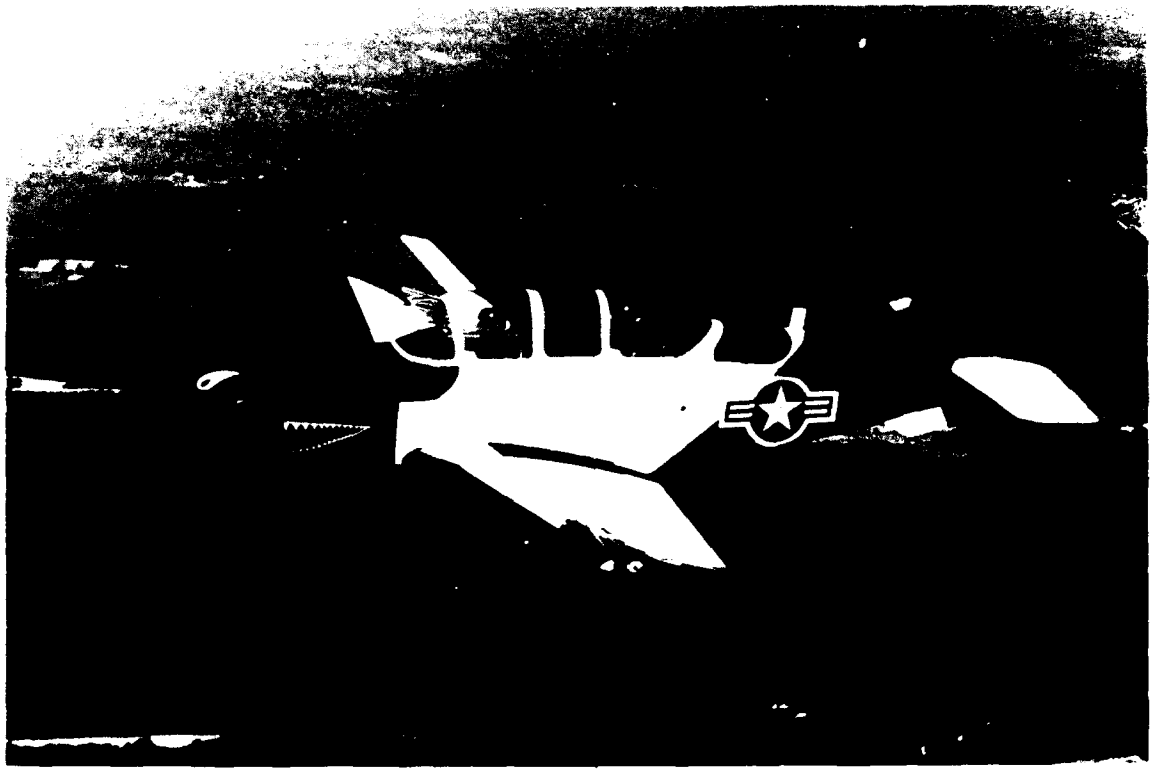
Among the Airborne and Special Operation Test Board's most important missions is the certification of loads for airdroping. The Board uses photography to document the effectiveness of rigging, extraction, and airdrop techniques. The photographs are taken from photo-chase aircraft, first T-28 and later T-34 two seater-trainers, which can fly along with the air drop mission and sequentially photograph the extraction and dropping of the equipment or personnel. The photographs that follow show the chase aircraft and examples of the photographs taken during missions. Illustrations 25 and 28 above offer additional examples of the latter.



29. Three T-28 photo-chase aircraft. (*Airborne and Special Operations Test Board*)

Before 1987 the Board's table of distribution and allowances included T-28 Air Force Trainers, pilots, and photographers. Over time a problem developed when the Air Force began to be able to fly its missions at speeds beyond the flight capability of the T-28s, which were later mothballed as a consequence.

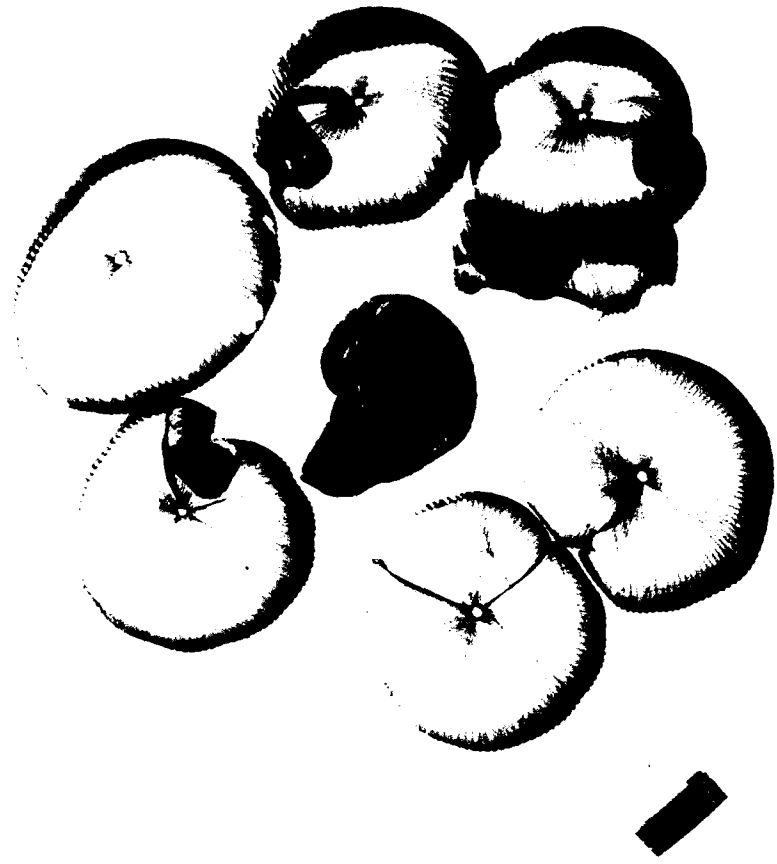
30. A T-28 flying a mission with a C-130 cargo aircraft. (*Airborne and Special Operations Test Board*)



31. T-34C aircraft. (*Airborne and Special Operations Test Board*)

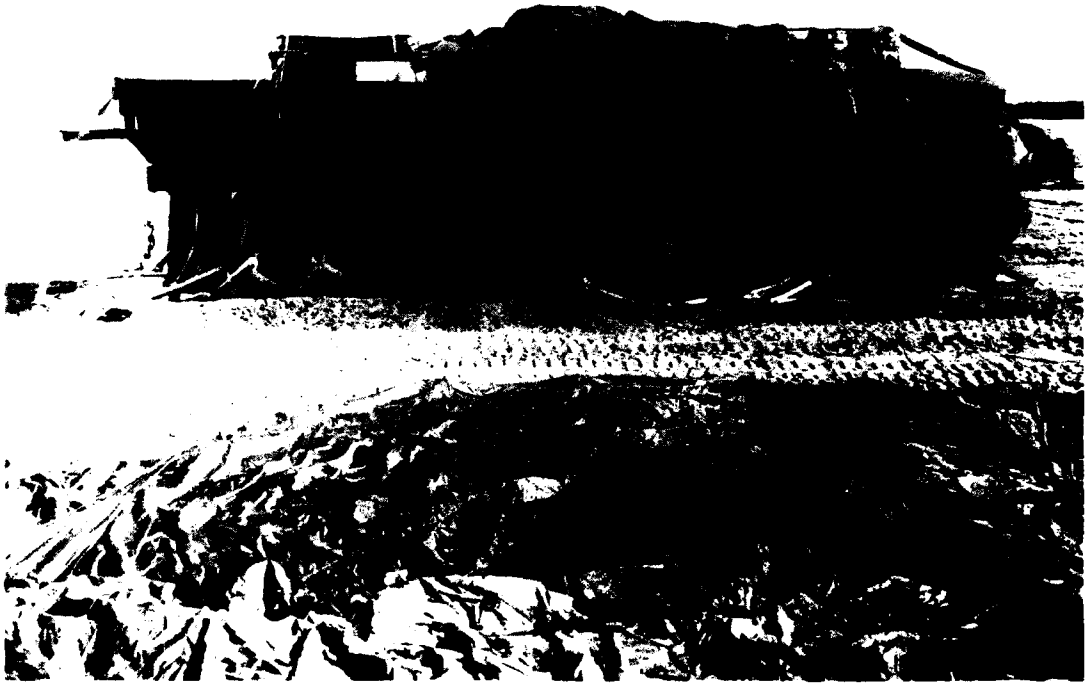
32. A C-130E dropping a road grader weighing more than 36,000 pounds at Sicily DZ, Fort Bragg, North Carolina in 1983. (*Airborne and Special Operations Test Board*)

As a potentially long-term solution, the Navy then loaned the Board three T-34s. Because the Navy's operational requirements changed, it later asked for them back. The T-34s were returned in July 1989. Subsequently, four T-28s were taken out of mothballs, three for operational requirements and one as a maintenance repair parts aircraft. But as one can imagine they were kept flying only with extreme difficulty.



33. A load under parachutes. (*Airborne and Special Operations Test Board*)

Since it was becoming apparent the T-28s could not much longer fulfill the mission, the Board initiated the process to acquire new aircraft. It now sought not merely to replace the old plane, but to acquire an aircraft that would meet the challenges of emerging technology and doctrinal requirements. New technology expects to make it possible to conduct drops at higher velocities, hence requiring a faster chase aircraft. As this is being written, the Army has allocated funds to purchase such an aircraft, although it has not been determined which it will be.



34. A two and a half ton cargo truck after Low Velocity Airdrop. (*Airborne and Special Operations Test Board*)

APPENDIX I
PREDECESSORS TO ABNSOTBD

Test Platoon	1940
Infantry Board (oversight of testing of airborne equipment)	1940-41
88th Airborne Infantry Battalion	1941-1942
G-4, Airborne Command	March 1942-November 1942
Test and Development Section, Airborne Command	November 1942-February 1944
Materiel and Development Section, Airborne Command	February-December 1944
Airborne Board	December 1944-October 1945
Army Ground Forces Board #1	1945-1948
Army Field Forces Board #1	1948-1953
Board #1, Office of the Chief of Army Field Forces	1953-1954
Board #5, Office of the Chief of Army Field Forces	1954-1955
8576th DU, Board #5, Continental Army Command (CONARC)	February-August 1955
7105th SU, Board #5, CONARC	August 1955-December 1956
U.S. Army Airborne and Electronics Board	1957-1962
U.S. Army Airborne, Electronics, and Special Warfare Board (TECOM)	1962-1970
U.S. Army Airborne, Communications, and Electronics Board	1970-1978
U.S. Army Airborne Board	1978-1984
U.S. Army Airborne and Special Operations Test Board	1984-1988
TEXCOM Airborne and Special Operations Test Board	1988-present

APPENDIX II
BOARD PRESIDENTS, 1944-PRESENT

COL Chester B. DeGavres	December 1944-September 1945
BG Guy O. Kurtz	October 1945-September 1948
COL Louis J. Compton	September 1948-October 1951
COL Clyde M. Hallam	November 1951-March 1954
COL Philip H. Enslow	March 1954-June 1954
COL Frank C. Paul	June 1954-January 1957
COL John W. Paddock	January 1957-June 1957
COL Harvey J. Jablonsky	July 1957-February 1959
COL James F. Roberts	March 1959-May 1961
COL William J. Boyle	June 1961-August 1961
COL Albert R. Brownfield	August 1961-February 1964
COL William J. Boyle	February 1964-July 1964
COL Joseph F. Ryneska	July 1964-May 1966
COL James M.S. Strickland	May 1966-May 1967
COL Karlton Warmbrod	June 1967-November 1970
COL Peter E. Kelley	November 1970-January 1973
COL Donald A. Seibert	February 1973-May 1974
COL Robert Apt	June 1974-August 1975
COL Bruce E. Wallace	September 1975-October 1978
COL G.G. Thomas	November 1978-June 1980
COL C.H. Ferguson	July 1980-September 1981
COL W.R. Foley	September 1981-January 1984
LTC F.J. McGrail	February 1984-March 1984
COL W.T. Palmer	March 1984-July 1987
COL Gary B. Gilmore	July 1987-July 1989
COL Frederick J. Hillyard	July 1989-present

APPENDIX III
AIRBORNE TEST DIVISION DIRECTORS
1949-PRESENT

LTC Mozley	March 1949-August 1949
LTC Connor	August 1949-October 1950
LTC Leahy	October 1950-July 1953
COL Paddock	July 1953-June 1954
LTC McKnight	June 1954-June 1955
COL Griswold	June 1955-June 1958
COL Erikson	June 1958-February 1959
LTC McKnight	March 1959-August 1959
COL Keist	August 1959-July 1962
COL Joseph W. Dale, Jr.	January 1965-August 1965
LTC Edwin H. Patterson	August 1965-June 1966
MAJ John W. Keller	June 1966-October 1966
LTC Otis H. Rogers	October 1966-August 1967
LTC C.W. Echels	August 1967-June 1968
LTC R.E. Luttrell	June 1968-June 1970
MAJ P.J. Thomas	June 1970-October 1970
LTC R.L. Reid	October 1970-July 1974
LTC W.R. Smith	July 1974-Februayr 1975
LTC B.L. Robinson	February 1975-February 1976
LTC E.T. Hayes	Februay 1976-July 1978
LTC Elwood P. Sutton	September 1978-March 1979
LTC Delton T. Murdoch	March 1979-June 1980
LTC James D. Davidson	September 1980-August 1981
LTC John D. Lewis	September 1981-September 1983
LTC Sergei V. Olive	October 1983-September 1984
MAJ Edgar T. Lampkin	October 1984-May 1987
LTC Ned Longsworth	May 1987-July 1989
MAJ James Bryant	October 1989-present

APPENDIX IV
AIRBORNE TEST LOAD, 1946-1989

YEAR	NUMBER OF TESTS	YEAR	NUMBER OF TESTS
1946	40	1968	50
1947	19	1969	53
1948	30	1970	24
1949	19	1971	22
1950	27	1972	18
1951	32	1973	24
1952	39	1974	40
1953	28	1975	26
1954	23	1976	31
1955	21	1977	32
1956	12	1978	24
1957	56	1979	36
1958	48	1980	43
1959	50	1981	23
1960	89	1982	27
1961	51	1983	48
1962	37	1984	42
1963	57	1985	46
1964	42	1986	29
1965	47	1987	20
1966	69	1988	29
1967	49	1989	25

INDEX OF NAMES, SUBJECTS, AND ACRONYMS