

Spring 2014

Women's Air Force Service Pilots: They Were Equal To Men in Training and Skill

Vic Caudillo

Western Oregon University, vcaudillojr10@mail.wou.edu

Follow this and additional works at: <http://digitalcommons.wou.edu/his>



Part of the [Military History Commons](#), and the [Women's History Commons](#)

Recommended Citation

Caudillo, Vic, "Women's Air Force Service Pilots: They Were Equal To Men in Training and Skill" (2014). *History Department*. Paper 30.

<http://digitalcommons.wou.edu/his/30>

This Paper is brought to you for free and open access by the Capstone and Seminar Papers at Digital Commons@WOU. It has been accepted for inclusion in History Department by an authorized administrator of Digital Commons@WOU. For more information, please contact passehle@wou.edu.

Women's Air Force Service Pilots:

They Were Equal To Men in Training and Skill

By

Vic Caudillo

Senior Seminar: Hst 499

Professor David Doellinger

Western Oregon University

May 28, 2014

Readers

Professor Kimberly Jensen

Professor John L. Rector

Copyright Vic Caudillo, 2014

Women's Air Force Service Pilots

During World War II (1941-1945), the United States manufacturing industry produced products for the war effort in extraordinary numbers. In the aircraft industry alone planes were built at such an alarming rate that manufacturers were rolling pursuit aircraft (P) or fighters, and bombers (B) at one an hour to a total of 13,738 P-40's, 14,686 P-51's, 12,692 B-17's just to name a few.¹ The Air Force² needed skilled pilots to fly them from manufacturing plant to various Air Force bases. One group of pilots that would assist in this ferrying venture was the Women's Airforce Service Pilots (WASPs). From 1942 through 1944 these women in training and knowledge, were equal to their male counterparts. Their ability to ferry any aircraft that was manufactured came because of two enterprising women, Jacqueline Cochran and Nancy Love. Even though these two women had an important part in getting the WASPs off the ground, the key ingredient to the success of the WASPs was their military training. During the twenty-four months that the WASPs were operating, they went through various training changes. At first because of the large amount of flying hours required the first set of women had only minimal military training depending on their experience. Then in 1943 the demand for more pilots reduced the required flying time for WASP applicants thus implementing a military structured training school just as the men. This revamped training included a ground school that included theory of flight, engines, navigation and instruments plus other subjects. They also had to increase their flying time on military aircraft starting with primary trainers (PT), then to basic trainers (BT), and finish with advanced trainers (AT). This additional training meant that the women would be in training for approximately four months to seven and a half depending on the time of entry to

¹ Jeremy J. March, "Liberators, Mustangs and "Enola Gay,"" *AIR power* Vol. 23, Issue 5 (Sep/Oct 1994): 2-13, <http://ezproxy.wou.edu:4106/ehost/> (accessed March 26, 2014).

² During World War II the main military flying service was referred to as U.S. Army Air Corps. For simplicity and consistency this paper will use Air Force.

training.³ Because of this training the WASPs would be the equivalent of their male counterparts in ability to handle military aircraft. However not all writers chose to concentrate on training when writing about the WASPs.

Molly Merryman in *Clipped Wings: The Rise And Fall of The Women Airforce Service Pilots (WASP's) of World War II*⁴ emphasizes that the WASP's were strictly experimental, not an actual organization to help out in the war effort. She explores their development, training, missions out in the flying field, and their eventual disbandment. However Merryman makes a point to stress the struggles the women went through to be able to fly the same aircraft that the men were flying in and the hardships that they had while performing their missions. Marianne Verges *On Silver Wings: The Women's Airforce Service Pilots of World War II, 1942-1944*⁵ makes similar points as Merryman, but focuses on the personal events that took place. Though both books have slight variations to events, they both explore the gender issues. Both agree that the Womens Airforce Service Pilots would not have gotten started had it not been for the determination of two aviatrixes, Jacqueline Cochran and Nancy Love.

In Rhonda Smith Daugherty's *Jacqueline Cochran*⁶ the WASPs are presented from Cochran's perspective as founder of the WASPs organization. The book centers mostly on the achievements of Cochran, so the book is not entirely on the WASPs, but also on the experiences that Cochran had before the war period and after the disbandment of the WASPs. Daugherty also focuses on the struggles that Cochran had trying to get the Womens Airforce Service Pilots idea off the ground. For example, she campaigned for two years prior to the United States entry into

³ Chambers, Merritt M. History of the Womens Airforce Service Pilots and Activities in the AAF Training Command a Summary of the Womens Flying Training Program, 16 November 1942 – 20 December 1944 (Fort Worth, Texas: Headquarters AAF Training Command, 1945), 30-34.

⁴ Molly Merryman, *Clipped Wings: The Rise and Fall of the Women Airforce Service Pilots (WASPs) of World War II* (New York: New York University Press, 1998).

⁵ Marianne Verges, *On Silver Wings: The Womens Airforce Service Pilots of World War II, 1942 – 1944* (New York: Ballantine Books, 1991).

⁶ Rhonda Smith Daugherty, *Jacqueline Cochran* (Jefferson, North Carolina: McFarland & Company Inc., 2012).

the war for women to ferry aircraft, but the Roosevelt Administration would have nothing to do with it since the U. S. was not in the war. Then after Pearl Harbor she encountered the gender discrimination and male hostility from the Air Force, who believed that women did not have the strength or stamina to fly military aircraft.⁷ When the book covers the part on training it does only from broad view. For example: they got up at 6:30 am, went to breakfast, then out to the flightline and flew in the mornings, then ground school in the afternoons, Daugherty provides nothing specific as to what classes they had for ground school or preparation time for flights. When Daugherty does mention the WASPs she writes of those who flew with Cochran or those who were close to her, except on specific occasions such as a cause of death or a specific mishap. Since the book is about Cochran she does stand out, Daugherty concluded that Cochran was selfish and egotistical. While she may have been egotistical, that almost was required for a woman like Cochran in order to achieve the goal of pursuing the WASPs program. Her selfishness is questionable; whatever she did was for the betterment of WASPs. For example she tried to get them militarized so that the women would have benefits. They had none as a civilian organization.

Sara Byrn Rickman's *Nancy Love and the WASP Ferry Pilots of World War II*⁸ in her book the WASPs are presented a little bit different. Because Rickman's book centers on Love it focuses on her achievements as a pilot before and after the war, as well as her time with the WASPs. When the book covers Love's time with the WASPs of course it is from her perspective as far as what she had to deal with in order to get them started. However when the WASP's are mentioned individually in training and duty performance, it is usually in reference to her first group of twenty-five women pilots called the "originals".⁹ Rickman covers the WASPs from their initial idea through their disbandment. Yet, like Daugherty, she mentions little about their

⁷ Daugherty, 80.

⁸Sara Byrn Rickman, *Nancy Love and the WASP Ferry Pilots of World War II* (Denton, Texas: University of North Texas Press, 2008).

⁹ Rickman, 91.

training. Because most of her reference is to Love and the originals, who had little training as it was, as each women had in access of three hundred flying hours, maybe she felt training wasn't that much of a factor. Rickman does mention that the women had training in the specific aircraft that they were ferrying. Rickman's book is excellent in that it gives more information on who, among the originals was specifically trained to fly pursuit aircraft, the coveted aircraft that most women wanted to fly but few had the chance to do so. She also emphasizes it was the type of aircraft most men thought women could not handle. The WASP's were not the first group to enter service ferrying aircraft. That belongs to the WAFFS (Womens Air Force Ferry Service), which was started by Nancy Love just before Cochran started the WASP program. The use of WASP for both is for easier understanding, besides the WAFFS were emerged into the WASPs by August 1943.¹⁰

Lois K. Merry *Women Military Pilots of World War II*¹¹ doesn't focus in depth on the WASPs because her book covers female pilots of other countries and not just the U.S. So, when she discusses the start up of the women's military units, Merry explains how the British, Russian and German Air Forces enlisted women into helping in the war effort as well as the United States. Thus every chapter in the book describes how the role of women pilots affected all the countries involved in the European theater of World War II. Her book does provide comparisons as to how other countries treated their female pilots. One example is the British. Women pilots could not fly into combat, but the British air ministry had no problem of having them ferrying aircraft from their factories to air bases and women were not limited on which aircraft they flew. This was quite different from the struggles that Love and Cochran had to get the WASPs into action. Russian women pilots formed into combat units and flew missions against Germany at night as well as daylight. Merry's book is informative as it gives a different point of view from the United

¹⁰ Rickman, 131-132.

¹¹ Lois K. Merry, *Women Military Pilots of World War II* (Jefferson, North Carolina: McFarland & Company, Inc., 2011).

States and other countries on their usage of female pilots to help out in the war effort. From the above books mentioned there is a trend that seem to follow the writers and that is there is not much mentioned in specific about the WASPs training. Primary sources have to be utilized in order to present a more thorough perspective of the training process that the women went through to validate that their training and skills learned made them equal to men in flying military aircraft.

The majority of the WASPs that wrote letters or did oral interviews did not cover their training period the same way or provide technological references and the practices in flight training that was used then. This accounts for the use of outside sources as well as the WASPs themselves for references. Merritt M. Chambers, *History of the Womens Airforce Service Pilots and Activities in the AAF Training Command a Summary of the Womens Flying Training Program, 16 November 1942 – 20 December 1944.*¹² This Air Force Training Command document is an account of the WASP program. As an official military document it serves as a reference to various information about the WASPs such as flying hours, type of aircraft flown and changes in their training requirements. This document will also be used as a source of information for numbers of students as well as different stations, and number of aircraft. There were two variations of engines used during the war period the Radial and the Inline for the radial description the manual; *Instructions for the Installation, Operation, and Maintenance of the Wright Cyclone 14 Aircraft Engine,*¹³ will be used in the training aspect of the paper. At this point thank you Texas Women's University (TWU) out of Denton, Texas. Without which this project would not have been completed. TWU provided the following important primary sources that give this paper its' strength. Adaline Blank,¹⁴ This source is written letters to Adaline's older

¹² Merritt M. Chambers, *History of the Womens Airforce Service Pilots and Activities in the AAF Training Command a Summary of the Womens Flying Training Program, 16 November 1942 – 20 December 1944. Headquarters AAF Training Command, 1945.*

¹³ Instructions for the Installation, Operation, and Maintenance of the Wright Cyclone 14 Aircraft Engine, Wright Aeronautical Corporation 1942

¹⁴ Adaline Blank, "Adaline Blank: Letters to Home," Texas Woman's University, Denton Texas (2002), <http://www.twu.edu/library/wasp.asp> (accessed 17 January 2014).

sister while she was in the WASP program. Again this is only one persons perspective on the WASP program, however her letters are a good source as to specific training classes that WASP's took and will be used in that section of the paper. Betty Deuser Budde,¹⁵ her letters will provide more in depth type of aircraft flown while in training and also their horsepower ratings. She also gives insight to what type of flying maneuvers were taught while in training as well as tests taken and difficulties she had with certain classes such as navigation, mathematics and engine operations. Betty also gives us a glimpse of the social problems with her being a pilot of military aircraft. Jean Haskell Cole,¹⁶ this is an oral history of Cole's remembrance of her involvement with the WASP program. Her detail knowledge for motors, aircraft and flight characteristics and navigation will be used for the report in the training section. Another oral report is that of Virginia Campbell,¹⁷ she provides a good example of the frustrations that the WASPs encountered while flying military aircraft The other sources used from TWU that include documentation about training are from Madge Rutherford,¹⁸ Caro Bayley,¹⁹ and Inez Woodward,²⁰ as WASPs in training their personal perspective provides insight to specific training sections. These sources and others will provide information that will prove that the WASPs were just as good as the men in handling military aircraft.

By January 1940, Pauline Gower, the British version of Nancy Love, had convinced the British Air Transport Auxiliary (ATA), who reported to the British Air Mission, to allow women

¹⁵ Betty Deuser Budde, "Betty Deuser: Letters Home," Texas Woman's University, Denton Texas (2004), <http://www.twu.edu/library/wasp.asp> (accessed January 17, 2014).

¹⁶ Jean Haskell Cole, "*Jean Hascall Cole: An Oral History*," Self-Interview, Texas Women's University, Denton Texas (December 9, 1997) (<http://www.twu.edu/library/wasp.asp> (accessed 14 October 2011)).

¹⁷ Virginia Delaney Campbell, "*Virginia Delaney Campbell: An Oral History*," Interviewed by Jean Hascal Cole, Texas Woman's University, Denton Texas (1989), <http://www.twu.edu/library/wasp.asp> (accessed May 22, 2014).

¹⁸ Madge Rutherford Minton. "*Madge Rutherford: Letters Home*," Texas Woman's University, Denton Texas (1998). <http://www.twu.edu/library/wasp.asp> (accessed January 17, 2014).

¹⁹ Caro Bayley Bosca, "*Caro Bayley Bosca: Letters Home*," Texas Woman's University, Denton Texas (1995), <http://www.twu.edu/library/wasp.asp> (accessed May 22, 2014).

²⁰ Inez Woodward Woods, "*Inez Woodward Woods: Letters Home*," Texas Woman's University, Denton Texas (2005), <http://www.twu.edu/library/wasp.asp> (accessed May 22, 2014).

to ferry aircraft for the Royal Air Force. As members of the ATA, the women were commissioned second officers as they passed their flying checks.²¹ In Russia after Germany attacked in June 1941, Marina Raskova had Stalin's approval to organizing a women's flying regiment to assist in fighting the enemy.²² By the summer of 1941 the British Air Mission was in desperate need of pilots, and its chief Arthur Harris was hoping to convince the U.S. to have women fly for the ATA. President Roosevelt convinced Army Air Corp Chief Hap Arnold to talk with Jacqueline Cochran about coordinating with Harris to set American women to fly for the ATA.²³ One by one Cochran interviewed possible prospect for the British Air Mission and by October 1943 she selected twenty-five women. All passed their flight physicals and flight checks, and twenty-four passed the ATA physical and were ready for the trip across the Atlantic. Of all the American women who flew for the ATA only one was dismissed and that was Helen Richey because she damaged to many aircraft was released by the ATA and returned to America.²⁴

Even before the U.S. entry into the war the idea of using female pilots was considered in the late 1930's and early 1940's. However the Air Force's Commanding General Henry H. Arnold turns down the suggestion because he saw no use for female pilots, but back then the Air Force was short of planes not pilots.²⁵ The two most influential women that pushed the idea of women as ferry pilots were Nancy H. Love and Jacqueline Cochran.

Hannah Lincoln (Nancy) Harkness was born in February 14, 1914 in Houghton, Michigan, and grew up in a well to do home.²⁶ In November 1930 at the age of sixteen she acquired a private pilot's license making her at that time the youngest female flyer in the U.S.²⁷ While at Vassar College she got into trouble for buzzing the campus and was kept from flying for

²¹ Merry, 21-23.

²² Merry, 23-24.

²³ Merry, 25-28.

²⁴ Merry, 28.

²⁵ Merryman, 10.

²⁶ Rickman, 5.

²⁷ Rickman, 11-12.

a period of time. In 1934 she lost interest in school and decided to pursue a career in flying. In the Great Depression it was difficult for male pilots to make a living, let alone a female pilot. She secured a job with the government flying across the country finding possible rooftops that if marked would be a navigational aid.²⁸ In the mid-1930s Nancy met Bob Love, a professional pilot and they married in May 1936.²⁹ The young couple started an aviation business in Boston that blossomed from just a couple to several planes in just over four years, remarkable considering the time frame. In the period that she got her license and ran a successful business with her husband, Nancy Love became proficient with her flying skills. She got a commercial license while an undergraduate, increased her navigational skills while flying across the United States, was a test pilot for an aircraft company in New York, and flew in several air races while running a business. By 1940 America started building aircraft for England, it was then that Love got the idea to ferry planes. She ferried aircraft as far north as Nova Scotia, and logged hours transporting aircraft. At this time that the notion that flying aircraft from the factories to Air Force bases was a suitable job for any woman with good flying experience became a reality. In May of 1940 she was able to contact the Air Force through her husband who at this time was a reserve Air Force officer, and sent a letter proposing the use of women to ferry aircraft for the Air Force. Colonel Robert Olds read the letter and thought it a good suggestion, but the need wasn't there yet and he filed it for later.³⁰

Jacqueline "Jackie" Cochran on the other hand had a rag to riches life story. She was adopted by a poor family who scraped by a living working in sawmills across Florida and Georgia.³¹ As a teenager she got work at a beauty shop in Alabama and was doing well. Then Jackie tried her hand at nursing but found it distasteful and went back to working at a beauty salon in Pensacola, Florida. It was there that she discovered flying, as she was a frequent guest at

²⁸ Verges, 9-10.

²⁹ Verges, 10.

³⁰ Verges, 8-11.

³¹ Daugherty, 10-11.

the Navy air cadet's dances. The idea of flying and the challenges that it presented intrigued her. After Florida she ventured north to New York and worked as a hairdresser for a lavish salon at Saks Fifth Avenue.³² During the winter of 1932 she went South working for the same salon in Miami, Florida. It was here that she met her "Sugar Daddy" in the form of a Mr. Floyd Bostwick Odlum, a self-made millionaire. He bets Cochran the cost of lessons that she could not get her pilot's license in six weeks. He lost. From then on they formed a relationship and Cochran had unlimited access to the latest, fastest aircraft and the best trainers. Within four years of their meeting Cochran and Floyd married quietly. In 1937 she entered the Bendix Air Races and beat's Howard Hughes's speed record for distance from New York to Miami. Eleanor Roosevelt awarded her trophy. In September 1939, Cochran learned of the German attack on Poland and writes a letter to Eleanor Roosevelt outlining that women pilots could take on any non-combatant jobs and free up men to fight the war. Roosevelt liked the idea and presented it in her daily newspaper column. But military leaders did not agree. In 1941, with the Lend Lease Program and the U.S. sending bombers to England, Cochran at the suggestion of General Arnold, flew twin-engine bombers to the British. Now Jackie like Nancy is getting experience at ferrying aircraft.³³

Once the word was out that there was a need for women pilots to ferry military aircraft, there was no shortage of applicants. Total there were 25,000 women who applied for WASP training. But the selection process was tough and only 1,830 were accepted into the program, and 1,074 graduated.³⁴ During its two year run the WASPs training regimen went through various changes as requirements changed. Initially women were required to be from 21 to 35 in age and have a minimum of 200 hours flying time, pass a physical examination, flight test and written test. The initial 25 women selected the originals as they would call themselves trained in New Castle Air Force Base, Delaware. The "Originals" training would be different from the others because

³² Daugherty, 17-20.

³³ Verges, 11-14,19.

³⁴ Texas Womens University. "Womens Airforce Service Pilots." *Digital Archives*. <http://twudigital.contentdm.oclc.org> (accessed January 17, 2014).

they were the cream of the crop when it came to women aviators. Most of them averaged 1,100 hours flying time and were either instructors or aviation business operators.³⁵ For them training was more for adjusting to the military style of flying and learning how to operate within that spectrum such as formation flying, AAF landing and taxi procedures, filling out forms, doing transitional delivery paper work, maintaining military professionalism. This first group entered training in September 1942 and had their mission flying cubs by October.³⁶ Another reason for their light training was that they were only to deliver primary trainer aircraft, which were light and not very fast. In February of 1943, Cochran started the flight training for all women entering the WASP program. From here on out the Air Force, more specifically the Air Training Command (ATC) would pretty much control how training was accomplished and where.³⁷

The women who made up the 1,074 graduated WASPs came from various backgrounds and with just as many of degrees of confidence in their abilities to handle military aircraft. While some women sailed by the training others would wonder if they could even graduate. Yet these women would part of an elite class of pilots.

In June 1943, Adaline Blank was a twenty-five year old who worked as an Assistant Buyer for a New York business. She was an independent woman who loved flying and signed up when she heard about the WASPs. She had such a strong desire to be a member of the WASP program that she fibbed on her admission interview by claiming that she had fifty hours of flying time, of the required seventy-five. In reality Blank only had ten hours and on a seaplane at that. Completing her required hours by July was thought to be impossible by her sister Edwina.

³⁵ Verges, 45-49

³⁶ Verges, 45,52.

³⁷ Chambers, 20.

Adaline Blank being a persistent young lady signed up for flight training in an aeronautical school in Tulsa, Oklahoma and was ready when her class 43-W-8 began in July.³⁸

Another woman who would join the ranks of the WASPs was Alberta Paskvan. Born in 1919 in Black Eagle, Montana and raised by her grandmother after the death of her mother, Paskvan had no reason to fly being with a struggling family during the depression. However when a traveling flying circus came through town and she saw the barnstormers perform, flying became a fascination to the young Paskvan. When war broke out she moved to Seattle to work for the Navy. It was some time later while working for the Navy that she learned about the WASPs. Because no civilian flying was allowed in the Pacific Coast, she had to go to Yakima to get flying lessons. After getting her private pilot license and the required flying hours she applied for the WASP program. Not all applicants were like Paskvan, or Blank, working women out on their own, some were college graduates.³⁹

Caro Bayley was born in 1922 in the town of Springfield, Ohio. At thirteen she experienced her first plane ride in a Ford Tri-Motor airplane and thus began her desire to fly. She went to college at St. Mary's and graduated in 1941. After graduation Bayley wanted to pursue her flying, so entered the Civilian Pilot Training Program. After her completion of flight training she began working at Wright Patterson Air Force Base in Dayton, Ohio where she was able to maintain a flying position. In 1943 when the Army announced the Womens Airforce Service Pilots Program, Bayley immediately applied. She would leave for Sweetwater, Texas in May to become a member of class 43-W-7. Along with Bayley another woman would join the ranks of college graduate in the WASP program.⁴⁰

³⁸ Blank, 2.

³⁹ Kinney, 2

⁴⁰ Bosca, 6.

Inez Woodward was born in St. Louis, Missouri to Laura Burt Woodward and George Harvey Woodward. Woodward would grow up in St Louis and accompany her father to his friend's work place at Scott Field. She got to sit in various cockpits and move the control stick around and imagine that she was up and flying. In addition to visiting Scott Field she also enjoyed watching Curtis Jenny's making touch and goes on the field next to her home, where she would wave happily as they flew by. After finishing high school Woodward entered college at the University of Missouri School of Journalism. She Graduated in 1938 and began working to save money to fly as often as she could. Through the Civilian Pilot Training Program, she earned her private license in June 1941 at Lambert Field in St Louis. After completing pilot training she worked for the Curtis-Wright aviation company to be close to the airfield. While a Curtis-Wright she met other pilots and acquired more flying time. It was during this time that she received a letter from Jacqueline Cochran about her flying time and experience. Soon afterwards she had an interview and was accepted in the WASP program and would join class 43-W-4. The Civilian Pilot Training Program was a key program that allowed some women to fly and another young lady that took advantage of this program was Madge Rutherford.⁴¹

Madge Rutherford was born in March 22, 1920 in Greensburg, Indiana. Rutherford in May of 1940 was the only women to complete the first class of Civilian Pilots Training Program offered at Butler University, Indianapolis where she worked as an assistant in the English Department to pay for her tuition. She graduated from Butler in June 1941 and stayed in the aviation field by serving in the Civil Air Patrol at Indianapolis. She continued to search for flying opportunities and sent a resume to the British Air Transport of the Royal Air Force Ferry Command, but was advised to log in 400 hours in twin-engine aircraft. In January of 1943 she got a telegram inviting her to Chicago to be interviewed for the Womens Airforce Service Pilots training program. She caught a train home after her acceptance to pack for the trip to

⁴¹ Woods, 10.

Sweetwater, Texas. In February she left for Avenger Field to become a WASP in training in class 43-W-4.⁴²

What did training involve? In February of 1943 the location for WASPs training was to be held at Avenger Field in Sweetwater, Texas.⁴³ Basically training was broken down into two parts. First there was the ground school that taught subjects such as navigation, theory of flight, engines, radios, Morse code, and meteorology.⁴⁴

Engine training, required in knowing about magnetos, spark plugs, pistons, timing, oil pressures, and more. Bette Budde mentions in her letters to her sister that engines are so difficult and that she got the worst score of 60 percent on one of her test.⁴⁵ There were at that time two basic styles of engines; Radial, and Inline. The women had to know each and the differences between the two. The radial was round in configuration and came in odd numbered pistons for balance usually seven or nine. Take for example the B-17, it had four Pratt & Whitney Radial R-1820 -97's which had one row of nine pistons rated at about 1200 horse power (hp) per each engine.⁴⁶ Another aircraft was the P-47 one of the pursuit aircraft, this plane also had a Pratt & Whitney, but in this case a single R-2800-59 rated at over 2400 hp.⁴⁷ Most of the WASP's had flown planes with HP ratings around 50 to 200. Radials were also air cooled which means they had no water or antifreeze, because the piston covers, or head, had small fins designed around the head so that the air circulating around them would keep the engine cooled to operating temperatures. To help the engines they had cowlings wrapped around the engines and cowl flaps or doors. Consequently, because radials had no fluid to keep them cool, operating them on the

⁴² Minton, 16

⁴³ Ibid

⁴⁴ Blank, 7-8.

⁴⁵ Budde, 41.

⁴⁶ Assistant Chief of Air Staff, *B-17 Pilots Manual* (Headquarters Army Air Force, Training. AAF Manual 50 – 13, Revised 1 May 1945).

⁴⁷ Paul Eden and Soph Moeng, *Aircraft Anatomy of World War II* (London: Amber Books LTD, 2007) 204-205.

ground required the women pilots to open the cowl flaps to allow the circulating air coming from the propeller to flow through keeping the engine cooled, then once in the air they would close as the air in altitude was cooler.⁴⁸ Radials also had less potential to seize so long as oil was supplied it would usually keep running. The inline was the other type of engine used that the women had to learn and the most used by the Air Force was either the Allison or the Packard and both came in twelve cylinders. Horsepower ratings for the inline changed by making modifications in their superchargers and carburetors and would eventually achieve 1500 hp rating pushing the aircraft to 437 mile per hour.⁴⁹ The liquid cooled inline required coolant, similar to what is used to put into a cars radiator, this circulated through the engine and through a radiator where cold air would cool the liquid, then back through the engine. The women not only had to have classroom knowledge they also had to disassemble parts of the engines. Madge Rutherford states in her letters that when she was in engine class they would leave the classroom with parts all over and their hands all greasy.⁵⁰ Engines was also probably one of the most difficult subjects to understand especially when one sees it up close and there are all these tubes, wires and massive engine blocks. Jean Cole states, “In ground school, we had some hands–on engines, too; I remember standing around looking at the engine. I had a terrible time with engines, I never could understand them very well. I could understand them in theory, but when you saw all the wires and everything put together, I couldn’t quite figure out how it all worked.”⁵¹ Yet this knowledge could be a lifesaver when flying, as Virginia Campbell found out when she was trying to climb over Guadalupe Pass. When she gained altitude to go over the pass, her engine would quit and she had to turn the aircraft around and lose the altitude or she would crash into the mountains. As she lost altitude the engine would turn back on. Campbell made three attempts to fly over the pass, with the same results, and then she realized that her carburetor heat for the engine was not

⁴⁸ Wright Cyclone Engines, June 1942.

⁴⁹ Eden and Moeng, 192-195.

⁵⁰ Minton, 53.

⁵¹ Cole, 4.

working. When she gained altitude her carburetor would freeze, thus no fuel for the engine. Once she figured it out she worked around the problem and flew back to base safely.⁵²

The one element that both engines had was torque. Because the engines were spinning the propeller/s at such a fast rate they developed a strong push motion to the direction the propeller/s were spinning. A stick or yoke pull in the direction opposite the spin of the prop was needed to keep the plane level especially in take off. One of the WASP's more than likely died from this when ferrying a P-38J, a twin-engine aircraft designed to fly with just one engine if operated correctly. Evelyn Sharp was ferrying the P-38 from California to New Jersey. When she arrived at an airport in Pennsylvania, she notified a field officer that she was having problems with the left engine. The next morning when she took off, just after clearing the runway her left engine quit and she crashed.⁵³ Chances are she wasn't prepared for that sudden stop of the left engine and the overpowering torque of the right, causing her to flip over and plummet into the ground. Engine course may have been difficult, but the knowledge only gave the WASPs a better chance of survival in flight. The navigation course in ground school also increased their flight survivability

The navigation course required a lot of mathematical applications and meteorological information in order to complete the task of flying long distance. In navigation the tools of the trade were pencil, maps, Jeppesen Plotter or ruler, and E6B calculator (a circular slide rule that allows the computations of airspeed, gallons per minute, wind speed and direction). Basically the pilot had to figure out how he/she was going to get from point A to point B. The weather played a factor here as the speed and direction of the wind can alter the final destination if not calculated correctly. Also when looking at a navigational map there are lines going from north to south called latitudinal lines and east to west called longitudinal lines and each crosscutting line is

⁵² Campbell, 6.

⁵³ Rickman, 188.

measured in degrees identified by a small circle in the upper right of the number and minutes identified by a ' above the number after degrees. Also the speed of the aircraft and the amount of fuel usage or gallons per minute had to be calculated in order to correctly figure out how the pilot will get to point B. Bette Budde gives a good example of the test that the WASP's were given while in navigation class:

“ From aircraft carrier USS Corregidor at 32 24 N, 69 48 W course 170, Speed 30 knots, with wind 20 mph 270 , plane takes off at 15:30 to investigate suspicious oil slick sighted at 29 36 N, 65 50 W. Planes air speed is 160 mph, fuel capacity 100 gals. Uses 24 gals per hour. When plane has returned on board, carrier takes new course to meet destroyer, McConnell at 32 8 N, 68 W. variation of area is 12 W. Find planes true course and magnetic heading to oil slick, then true course and magnetic heading to intercept ship. Time and location of interception. Time and distance to McConnell. Magnetic course to McConnell. Fuel remaining in plane after trip.”⁵⁴

The above example was a test for the women on their remembrance of different mathematical formulas that were taught in navigation class and their ability to apply them regardless of aviation background Navy or Air Force. Navigation was tough and some women did not complete their training because of failure in this class. However most WASP's like Bette Budde found navigation interesting and rewarding, simply because most of the women had no in depth training in navigation. A practice the women had learned was to establish checkpoints on the map. This was crucial to navigation as it let the WASPs know after some time in the air where they were in relation to the map. Mary Wiyall expresses the concerns of getting correct navigation when she wrote home and describes that she has to fly cross country, “How in the world will I be able to fly the airplane at a certain speed and altitude while I have a map in one hand looking for checkpoints, with a computer around my neck to figure ground speed and true heading and write down my ETA (Estimated Time of Arrival) and ATA (Actual time of Arrival) on my knee board.”⁵⁵ The navigational course really opened up some minds as to the complex involvement of getting an aircraft across the country and could be fatal if uncertain of checkpoints. Marjie Davis

⁵⁴ Budde, 40-41.

⁵⁵ Mary Ann Martin Wiyall, “*Mary Ann Martin Wiyall: Letters Home*,” Texas Woman's University, Denton Texas (1994), <http://www.twu.edu/library/wasp.asp> (accessed May 22, 2014), 44.

was flying with eleven other WASPs on a cross country flight. When she arrived over a small town, she was uncertain if it was the correct checkpoint, so Davis circled the town for an hour before deciding to land, which by that point it was dark and she clipped a power line and crashed.⁵⁶ If nothing else the Davis incident drove home the importance of proper calculations for checkpoints in cross country flights. Then next for the WASPs was how to get to point B when you can't see where you are going.

Probably the hardest thing for a pilot was to be able to rely totally on the instruments, and that's where the Link Trainer helps out. Ed Link as a child helped out in his father piano and organ facility repairing and helping out fixing the bellows of damaged organs. While still in his teens he started flying and fell in love with aviation, but lack of funds limited his flying. So Link began wondering if it was possible to construct a mechanical device that could work like an airplane, but was stationary. After 18 months of working on the project in his father's organ facility basement, he completed what would be known as the Link Trainer. Basically it was a stubby airplane on top of a box that contained a compressor that controlled four bellows below the plane. Lela Loudder called the Link trainer a ridiculous looking contraption, a toy airplane with stubby wings that turned and bobbed on a pedestal.⁵⁷ By the time the WASPs were organized Link trainers were in common use for all pilots in U.S. military training. Adaline Blank mentions how the Link trainer was a lifesaver. She recalls how when you can't see the ground it was easy to lose your sense of direction and stability and the Link allowed them to make mistakes and rely on the instruments. Blank also mentions how scary it was to be in the trainer because once she closed the canopy she was in darkness except the lights to the instruments and being blocked from the outside.⁵⁸ The WASP's were required to have at least 35 hours in the Link

⁵⁶ Marjarie Osbourne Nicol, "*Marjarie Osbourne Nicol: Letters Home.*" Texas Woman's University, Denton Texas (1995). <http://www.twu.edu/library/wasp.asp> (accessed May 23, 2014), 52-53.

⁵⁷ Verges, 93-94.

⁵⁸ Adaline Blank, 15.

trainer, which greatly improved their instrument flying. Madge Rutherford found the link training a savior when she flew a night cross-country flight. She had to fly a 350 round mile trip to Mineral Wells. When she was close to her destination her group encountered heavy overcast and had to fly home on instruments. Arriving at home station she stated, "The airport never looked so beautiful."⁵⁹ While the Link trainer provided the instrument reliability among the students it was the actual flying that could become a challenge, and sometimes fatal.

Second there was flight training which consist of flying various aircraft in three different phases starting with the primary trainer (PT), then moving on to the basic trainer (BT), and finishing with the advanced trainer (AT). At each phase of flying instructors are teaching the women different aspects of aircraft handling, such as landing techniques, take off procedures, or navigational practices. The completion of each phase must be passed by a check ride with a civilian instructor, then a military instructor.⁶⁰

According to Major Chambers in *History of the Womens Air Force* the training went from 4 months, then to 22 1/2 weeks to finally in the last classes 30 weeks. The instructions were broken down to three phases, primary which was basic flying, to intermediate now included transition to faster more powerful aircraft and instrument flying, some night flying and finishing with advance training to include formation maneuvers and longer distance night flying. He argues that the increase in time was to compensate for the diversity in job requirements and change in the type of aircraft the women would be flying.⁶¹ Exercise training was also increased to improve mental alertness and increase upper body strength, again to compensate for diversity in job requirements and variety of aircraft flown. The aircraft did not have hydraulic assist to help in handling the plane. The faster the aircraft went the more strength required to maneuver. Mentally the faster the aircraft the quicker the response time had to be in making adjustments, to think

⁵⁹ Rutherford, 56.

⁶⁰ Blank, 10-21.

⁶¹ Chambers, 21, 24, 33, 34, 40.

ahead of the plane. Even though the WASPs had their private pilots license and anywhere from 75 to over 1000 hours flying time,⁶² for most it was in light aircraft with less than 175 horsepower, now they were flying in aircraft excess of 600 horsepower ratings such as the advanced trainer the AT-6 Texan.

The women started with primary trainers and they varied, the most popular were the PT-17 or PT-19.⁶³ Adaline Blank quickly noticed the difference between the PTs and the aircraft she flew back home, “That PT is so different from the Cubs I flew at Spartan....It is much faster, twice as much horsepower and there are many more instruments to think about.”⁶⁴ The PTs were open cockpit airplane that most WASPs found fun to fly. Inez Woodward wrote home about flying the primary trainer and that she found the training on these planes wonderful.⁶⁵ As fun as these primary trainers were to the women, they had to be careful and watch out for rattlesnakes. During the daytime when it was hot the snakes would slither to cool spots, but at night they would come out and hunt then hide wherever they could. One morning a novice PT trainee was to solo in her aircraft, once airborne she noticed a rattlesnake by the flap hinge, and starting to crawl towards the cockpit. She jostled the plane side to side until the prop wash blew the snake off⁶⁶ and sometimes they got disoriented as in the case of Lela who one day while getting a check ride twice landed her aircraft in the wrong direction which landed her in the psychiatric ward of the hospital for pilot fatigue.⁶⁷ The flight training was intense as the women would go from ground school in the morning to flight training in the afternoon. As strenuous as the training was the women handled themselves well and were fascinated with the experience. Jean Cole stated “I just loved instruments in the airplane because you would make these squares, and these 270 – degree circles, and then go another direction and do 450’s, and then 270’s, and come back where you

⁶² Chambers, 15,17,

⁶³ Chambers, 37.

⁶⁴ Blank, 7.

⁶⁵ Woods, 11.

⁶⁶ Cole, 5-6.

⁶⁷ Verges, 116-117.

started , and it was a complicated sort of maneuver; it was a very neat thing to do.”⁶⁸ Once primary training was completed the women moved to basic trainers.

The basic trainer course not only involved flying faster aircraft, but it now included instrument flying and some cross country (XC) flying plus night flying. The aircraft used for the basic trainer course were the BT-13 or BT-15 both were mono-wing aircraft with a closing hatch for the cockpit and had radios for communication with the instructor and control tower. Where the PTs were fun the BTs were more complex. Lela Loudder found this out not only did it have radios and an enclosed hatch, but also three pages of procedures that had to become second nature to her. Also the 185 mile per hour speed gave the BT-13 a tendency to oscillate in a spin and cause it to crash.⁶⁹ The BTs were a handful to handle and required much more alertness on the part of the WASPS. Betty Budde experienced this when she first started flying the BTs; “...forced landing on these you have to lower 20 degrees of flaps, change prop pitch from high to low, change gas tanks, and open the hatch. ‘Course, all this time you’re supposed to find a field and watch out for other planes.”⁷⁰ BTs were the first aircraft the women learned to fly on instruments. The WASPs had to pull over a hood in flight that limited their vision to just inside the cockpit. For most of these women instrument flying was a new concept. The idea that one could maneuver an aircraft in flight and not see the ground and still get from point A to point B on instruments without crashing must have been exhilarating. Jean Cole had fun with instruments, she thought it was neat to fly precision square patterns on instruments alone then wind up back where you started.⁷¹ Another WASP that found instrument flying interesting was Caro Bayley. “When you are under the hood it really is amazing, I can’t tell whether I’m climbing or gliding or whether I’m turning to the right or left except by looking at the instruments.”⁷² Cross country

⁶⁸ Cole, 6.

⁶⁹ Verges, 118.

⁷⁰ Budde, 34.

⁷¹ Cole, 6.

⁷² Bosca, 31.

flying is introduced in BT training. In the navigation section it is mentioned how treacherous it could be if not calculating correctly, but not all women had a problem with XC. Sara Chapin enjoyed flying long distances away from home base. She flew a 350-mile round trip, and thought it was a snap. The journey was so easy for her that to relieve the monotony of marking checkpoints, she practiced Morse code by clicking the radio button sending messages to a fellow WASP in flight.⁷³ The women also had to endure aircraft that were designed for men when on XC training. Take for instance Virginia Campbell, when enroute to El Paso Air Field, she had to relieve herself. Being too shy to ask for a ladies room at El Paso, she decided to use the relief tube in the aircraft. After considerable amount of time and wobbling through the air she managed to lower her clothes to her ankles. Having never used a relief tube before, Campbell gets all her clothes wet and now has to pull them back on.⁷⁴ This goes to show how determined the women were to complete their training even at the expense of flying aircraft not designed for them. Once the women completed their check rides in the BT it was on to the advanced trainer.

In the advanced trainer the WASPs had their hands full trying to manage the AT-6 with a 650 horsepower rating that was considerably more than the 420 to 450 horsepower ratings of the BTs, it would be a challenge. The WASPs still had to go through cross country and instrumentation flights to include more night flying. Other than the fact that the AT-6 had more horsepower the training did not vary much from the BT. The AT-6 was the plane that all the women were anxious to get to and Alberta Paskvan expressed this in her letter home, "Is it ever a ship. Man oh man. I pinch myself every morning to make sure its me and awake." Yet, as fascinating as the aircraft was it would keep some women, such as Paskvan, up at night because of its complexity, "Truthfully it is a complete headache. The cockpit procedures is something that keeps us awake night and mumbling in our sleep. What with retractable landing gear, flaps and

⁷³ Sara Chapin Winston, "*Sara Chapin Winston: Letters Home*," Texas Woman's University, Denton Texas (1995), <http://www.twu.edu/library/wasp.asp> (accessed May 23, 2014), 23.

⁷⁴ Campbell, 9-11.

gadgets.”⁷⁵ The handling of the aircraft could sometimes be tricky and as always dangerous. Osbourne learned this when she was trying to start her aircraft. She used the wobbler pump to inject fuel into the carburetors, but pumped it to much that when she started the engine it caught on fire and she had to evacuate the aircraft.⁷⁶ The speed of the AT-6 was great, the one item that most of the women had not dealt with before was the retractable landing gear. The smaller the stature of the women the harder it was to get the gear up or down as Caro Bayley discovered, “There’s a lever you have to pull out and I’m practically down in the cockpit with both hands yanking at it.”⁷⁷ When it came to the AT-6 the one objective, other than being able to handle the aircraft, that the instructors were sure the women could handle with confidence was that of cross-country flying. Their navigational skills had to be honed and the best way was through cross-country flights. Madge Rutherford identified this through her letters home. At times her cross-country flights were over 300 miles and at others they were in hours as a flight that took five hour of cross-country flying.⁷⁸ Marjarie Osbourne also mentioned her cross-country flights in the AT-6, three cross-country flight in dual time to equal six hours plus one long flight to equal thirteen hours.⁷⁹ With the completion of the AT-6 training the women were set for graduation and ready to go out into their jobs.

So how did the women’s training differ from the men’s ...not by much. The main difference in the men’s training was that they spent time on acrobatics to learn the offense and defense tactics and also time on gunnery school, and these subject matters were taught separately from primary to advanced training. Both Merryman and Verges point out that the women at times seemed to have the edge on better control. An interesting case at point is when a Womens Field Training Detachment (WFTD) instructor and a captain from Ellington AAF base were on the

⁷⁵ Kinney, 18.

⁷⁶ Nicol, 47.

⁷⁷ Bosca, 41.

⁷⁸ Minton, 60, 62, 66.

⁷⁹ Nicol, 48-49.

flightline watching circling aircraft land. The captain bet the women's instructor at a dollar per bad landing that his "boys" could match the "girls". One by one as the aircraft landed the men's instructor kept passing the bills to the Women's trainer to the point that he had to borrow to pay his debt, the WFTD instructor was all smiles.⁸⁰ Even though this is just one example it may be that women tried harder to attain their flying skills. This stems from the idea that men were expected to be pilots; it was the norm to go out train and handle powerful aircraft. For women it was a privilege to be offered the chance to operate these aircraft and for those who graduated the opportunities other than ferrying aircraft. It must also be noted that on top of the strenuous training, the women had to deal with a lack of facilities for sleeping and washing. It is not until they arrive at Sweetwater, Texas that they would have any barracks of their own.

Because the women were not a functional part of the military, once they graduated from training they became part of the Civil Air Patrol and as such were given a monthly salary of \$250 plus \$6.00 per diem. From this pay they had to furnish their own food, clothing, and housing unlike the male counter parts who given those items on top of their pay.⁸¹ Even with this salary and no G.I. benefits the women welcomed the tasks that were given. It was a chance to prove that they could handle a military aircraft just as well as men could. Initially the WASPs started with the transporting of trainers from the East coast to the Southwest or Southern states or West coast to the same area, as these were the locations of the majority of training bases. The WASPs handled themselves well and were more than capable in skill. However, they did encounter hardships in performing their duties. Helen Richards while delivering a Piper Cub took thirteen days to go from Middleton, New Jersey to Fort Smith, Arkansas because of inclement weather.⁸² For others it came in the form of gender prejudice as they found it hard to find accommodations or acceptance on some bases. When they dropped off the aircraft they were seen as probable

⁸⁰ Verges, 78-79.

⁸¹ Merryman, 14-15.

⁸² Rickman, 57.

saboteur or commanders who didn't want the WASPs at their location would have them relocate elsewhere.⁸³ Lela Loudder found this out when she arrived at Williams Field in Arizona. At the gate she was picked up and taken to her commander. Once she handed her orders to the commander he had no interest in having her at the base and proceeded to drive her off base to a civilian location. However she was persistent that she be allowed to stay on base and managed to get a room at bachelor officers' quarters.⁸⁴ Another example is when WASPs were at March Field towing targets they were given negative remarks that they were not on their toes, or planning ahead after only three days of flying from the flight leader. As the war years peaked the women were given more diverse tasks. At least one aggression against the WASP was fatal. Betty Wood died when she was making a landing and overshot the runway as she tried to go around her aircraft's engine quit and she cartwheeled off the runway. It was discovered that there had been large amounts of sugar in the aircraft's fuel tank, enough to make it quit, but Cochran kept it from public notice.⁸⁵ Some flew aircraft towing target tugs that were used for live firing, others towed gliders, and still some were used to fly as co-pilots on bomber aircraft. Dorothy Allen was one such WASP who had a chance to fly B-26's, though she had a tough time of it because she was small; Dorothy still managed and completed the training in transitioning to B-26's.⁸⁶ Eventually, some transitioned to fighter planes, the toughest to fly of all military aircraft. Why they were harder to fly, because of their agility and speed, most of these planes flew in excess of 350 miles per hour in that time it was like flying a jet fighter today. By the time of inactivation the WASPs had performed well, and were a great asset to their country. Their diversity had gone as far as even training pilots and also as test pilots for certain aircraft.⁸⁷

⁸³ Merryman, 24.

⁸⁴ Verges, 146-147.

⁸⁵ Verges, 131.

⁸⁶ Allen, Dorothy., "*Dorothy Allen: An Oral History.*" Interviewed by Dawn Letson, Texas Women's University, Denton Texas (December 3, 1997). <http://www.twu.edu/library/wasp.asp> (accessed 14 October 2011), 34-36.

⁸⁷ Chambers, 42-44.

There are some who questioned if the WASPs were really needed during the war, after all the U.S. had two oceans to protect her borders and had a abundance of resources to get her through war without the help of other countries. Once the U.S. industry got into gear and mass-producing aircraft there was no choice, but to use women pilots to assist in the war effort, the numbers produced speak for themselves. From December 1941 to August 1945 the Army Air Corp lost 14,903 pilots and 13,873 planes and these are stateside numbers not those lost overseas. So that's 14,000 pilots and over 13,000 planes that need replacement. Overseas the Army Air Corp lost over 43,500 aircraft of which all of had to be replaced.⁸⁸ By the time of inactivation the WASP ferrying pilots delivered 80 percent of all planes and did so with the admiration of those who used them. They performed their job even with the prejudices that surrounded them. Their diversity in jobs other than ferrying is proof enough that they were more than capable of doing non-combatant tasks as good as or equal to the men. If we look at statistics there's evidence that WASPs had a lower fatality rate then the men performing the same missions. In the twenty-four months that they were in service their monthly fatality rate was approximately 1.5 per month. Looking at the men's monthly rate from December 1941 to August 1945 it is roughly about 133 per month and that's state side incidents alone.⁸⁹ However because of their smaller group size the shock of fatalities had a greater impact among the women. Also there's a tendency to underestimate their value, looking at numbers helps to understand just how busy they were in their prime. I'll use fighters as an example, they delivered P-51's, P-47's, P-38's and P-39's total they comprise a sum of 50,900 aircraft⁹⁰ and that's not including the trainers or bombers. So were they equal to men in performance of noncombatant roles ... YES! And in certain situations better. One of the best attributes given to them is found in Merryman's book:

⁸⁸ Tillman, Barrett., "*The Cost of Doing Business: The Staggering Toll of War.*" Flight Journal (December 2009), 34-36

⁸⁹ Tillman, 1

⁹⁰ Tillman, 34.

“It was common for commanding officers to say they would rather have WASPs ferry airplanes across the United States than male pilots, because the WASP normally reached her destination a day or two ahead of time required by a male pilot to do the same job.”⁹¹

Were they perfect, no, they made mistakes, as did the men but the WASPs more then proved that because of their training they were more than equal to their male counterparts.

⁹¹ Merryman, 24-25.

BIBLIOGRAPHY

PRIMARY SOURCES

Allen, Dorothy. "*Dorothy Allen: An Oral History.*" Interviewed by Dawn Letson, Texas Women's University, Denton Texas (December 3, 1997). <http://www.twu.edu/library/wasp.asp> (accessed 14 October 2011).

Blank, Adaline. "*Adaline Blank: Letters to Home.*" Texas Woman's University, Denton Texas (2002). <http://www.twu.edu/library/wasp.asp> (accessed 17 January 2014).

Bosca, Caro Bayley. "*Caro Bayley Bosca: Letters Home.*" Texas Woman's University, Denton Texas (1995). <http://www.twu.edu/library/wasp.asp> (accessed May 22, 2014).

Brown, Mickey McLernon. "*Mickey McLernon Brown: Letters Home.*" Texas Woman's University, Denton Texas (2003). <http://www.twu.edu/library/wasp.asp> (accessed May 22, 2014).

Budde, Betty Deuser. "*Betty Deuser: Letters Home.*" Texas Woman's University, Denton Texas (2004). <http://www.twu.edu/library/wasp.asp> (accessed January 17, 2014).

Campbell, Virginia Delaney. "*Virginia Delaney Campbell: An Oral History.*" Interviewed by Jean Hascal Cole, Texas Woman's University, Denton Texas (1989). <http://www.twu.edu/library/wasp.asp> (accessed May 22, 2014).

Chambers, Merritt M. *History of the Womens Airforce Service Pilots and Activities in the AAF Training Command a Summary of the Womens Flying Training Program, 16 November 1942 – 20 December 1944. Headquarters AAF Training Command, 1945.*

Chief of Air Corps. "Aerial Navigation." The Signal Corps Training Film, 1-236, 1942.

Cole, Jean Haskell. "*Jean Hascall Cole: An Oral History.*" Self-Interview, Texas Women's University, Denton Texas (December 9, 1997) (<http://www.twu.edu/library/wasp.asp> (accessed 14 October 2011)).

Kinney, Alberta Paskvan. "*Alberta Paskvan Kinney: Letters Home.*" Texas Woman's University, Denton Texas (2003). <http://www.twu.edu/library/wasp.asp> (accessed 17 January 2014).

Minton, Madge Rutherford. "*Madge Rutherford: Letters Home.*" Texas Woman's University, Denton Texas (1998). <http://www.twu.edu/library/wasp.asp> (accessed January 17, 2014).

Nicol, Marjarie Osbourne. "*Marjarie Osbourne Nicol: Letters Home.*" Texas Woman's University, Denton Texas (1995). <http://www.twu.edu/library/wasp.asp> (accessed May 23, 2014).

Woods, Inez Woodward. "*Inez Woodward Woods: Letters Home.*" Texas Woman's University, Denton Texas (2005). <http://www.twu.edu/library/wasp.asp> (accessed May 22, 2014).

Winston, Sara Chapin. "*Sara Chapin Winston: Letters Home.*" Texas Woman's University, Denton Texas (1995). <http://www.twu.edu/library/wasp.asp> (accessed May 23, 2014).

Wyll, Mary Ann Martin. "*Mary Ann Martin Wyll: Letters Home.*" Texas Woman's University, Denton Texas (1994). <http://www.twu.edu/library/wasp.asp> (accessed May 22, 2014).

Special Thanks to Evergreen Aviation Museum for the following Primary sources:

B-17 Pilots Manual. Headquarters Army Air Force, Office of Assistant Chief of Air Staff, Training. AAF Manual 50 – 13, Revised 1 May 1945.

Wright Cyclone Engines, June 1942.

SECONDARY SOURCES

Tillman, Barrett. "*The Cost of Doing Business: The Staggering Toll of War.*" *Flight Journal* (December 2009): 29-38.

Bauman, Richard. "Link to the Future." *Aviation History* (May 2014): 48-53.

Daugherty, Rhonda Smith. *Jacqueline Cochran*. Jefferson, North Carolina: McFarland & Company Inc., 2012.

Eden, Paul and Moeng, Soph. *Aircraft Anatomy of World War II*. London: Amber Books LTD, 2007.

Federal Aviation Administration. *Pilots Handbook of Aeronautical Knowledge*. New York, NY: Skyhorse Publishing, 2014.

Karwatka, Dennis. "Edwin Albert Link." *Technology's Past* (December 2006): 11-13.

Marsh, Jeremy J. "Liberators, Mustangs and 'Enola Gay'." AIR power (military science) UNITED states. Army Air Force – History Vol. 23, Issue 5 (Sep/Oct 1994): 2-13. <http://ezproxy.wou.edu:4106/ehost/> (accessed March 26, 2014).

Merry, Lois K. *Women Military Pilots of World War II*. Jefferson, North Carolina: McFarland & Company, Inc., 2011.

Merryman, Molly. *Clipped Wings: The Rise and Fall of the Women Airforce Service Pilots (WASPs) of World War II*. New York: New York University Press, 1998.

Miller, Gordon H. "Link Trainer Memories." *Aviation History* (July 2013):

Rickman, Sara Byrn. *Nancy Love and the WASP Ferry Pilots of World War II*. Denton, Texas: University of North Texas Press, 2008.

Texas Womens University. "Womens Airforce Service Pilots." *Digital Archives*.
<http://twudigital.contentdm.oclc.org> (accessed January 17, 2014).

Verges, Marianne. *On Silver Wings: The Womens Airforce Service Pilots of World War II, 1942 – 1944*. New York: Ballantine Books, 1991.

