

Field Trip # 2: To National Museum of the United States Air Force

Host: Mr. Dan Strayer, Volunteer at the National Museum of the United States Air Force

Date: Monday, July 12, 2010

Time: 11:30 AM – 6:00 PM

Venue: National Museum of the United States Air Force, Dayton, Ohio

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The field trip to the National Museum of the United States Air Force in Dayton, Ohio was a combined trip for the RET and REU participants. The trip was headed by Dr. Kelly Cohen, Associate Professor of Aerospace Engineering and Dr. Anant Kukreti, RET Project Director, both from the University of Cincinnati. Mr. Cody Lafountain, a graduate assistant for the Bio-Inspired Flight project accompanied the RET participants and was able to answer many questions.

The National Museum of the U.S. Air Force is the world's largest and oldest military aviation museum. The museum began in 1923 with a collection of technical artifacts collected by the Engineering Division at [Dayton's McCook Field](#). According to Wikipedia, the free encyclopedia on-line, "In 1954 as the Air Force Museum it was housed in its first permanent facility, Building 89 of the former Patterson Field in [Fairborn](#), which had been an engine overhaul hangar, and many of its aircraft were parked outside and exposed to the weather. It remained there until 1971 when the current facility was first opened." More than one million people visit the 17-acre indoor museum that houses over 400 aircrafts and missiles. The museum's overall mission, as stated in the National Museum of the U.S. Air Force 2009 Annual Report is: "The National Museum of the U.S. Air Force collects, researches, conserves, interprets and presents the Air Force's history, heritage and traditions, as well as today's mission to fly, fight and win in Air, Space and Cyberspace to a global audience through engaging exhibits, educational outreach, special programs and the stewardship of the national historical collection. These statutory duties delegated by the Secretary of the Air Force are accomplished on behalf of the American People. *We are the keepers of their stories.*"

Once at the museum, the participants were greeted by Mr. Dan Strayer, a volunteer tour guide for the museum. The RET participants began the tour when, as Mr. Strayer stated, "mankind figures out how to fly and the Wright Brothers were damn good at it." The first exhibit was dated 1903, and showed the Wright Brothers' plane (see photograph on right). The first flight was two minutes long at a cost of \$4500 to build. During the time the Wright Brothers were experimenting with their plane, the U.S. Army was also working on a design; however, after spending \$70,000, the army had developed nothing meaningful, and it was President Roosevelt that suggested that the Wright Brothers be contacted because they had ideas that worked. The Wright Brothers first plane made four flights, but was destroyed on the fourth flight



due to its instability. The Wright Brothers understood how the plane needed to move in the air using pitch (up and down), yaw (right and left), and roll, but the issue was how one person could control all three at the same time. In 1910, the Wright Brothers had their only flight together; they didn't fly together in case something happened, one would always be able to continue to improve the invention.

About 1914, it was World War 1 that pushed the improvement of the airplane along when the question becomes "how can we use this invention during war?" The thought was, if you can fly at a constant speed for a long distance, you can see a lot of territory and you can see what the enemy is doing. One of the improvements made to the airplane during this time was to design an engine for which thrust can be controlled. Size and weight were taken into consideration when building a plane for war and guns were added to the front of the aircraft. Training to fly these planes was not very good and it had to be quick. Most were bi-planes (they have two wings), travelled at a speed of 130 mph and had fixed landing gear which created a lot of drag to the plane. Also during this time, a Dutchman named Anthony Fokker, created the first metal frame plane and called it the Fokker D. VII. While Europe saw great improvements in the aircraft design, the U.S. was concentrating on how to build engines for planes, and our contribution to World War I was a twelve-cylinder geared turbocharged aircraft engine. The photograph on the right shows Mr. Strayer next to the engine the U.S. built.



Battleships, controlled by the Navy, were being destroyed by airplanes called bombers. These are special types of planes which allow the pilot to fly over enemy territory and drop bombs on a target below. Fighter planes were also used during this time to travel along with the bomber planes and protect them from enemy planes on a mission. The most famous bombers during this time, Gotha G's, conducted bombing raids on London. At the conclusion of the war, many improvements had been made yet more were still to come.

About fourteen years later, just before the start of World War II, many changes had been made to the airplane and controls for flying. Some of these improvements included making them monoplanes (having one wing strong enough to fly the plane), planes made of all metal, engine turned by propellers which are located on the wing (rather than on the front of the plane), retractable landing gear, speeds of 230 mph, and better training for the pilots. One training technique that over 193,000 pilots had to conquer was the World War II Link Trainer. This was a "box-like cabin" that had all of the airplanes instruments in it, but the pilot was unable to see the horizon. This forced pilots to rely on their instruments rather than what they could see. Another great invention during this time that helped the pilots and improved fighting was radar. However, warplanes still only had two guns!

During World War 2, Germany used Blitzkrieg Operations – airplanes were sent in to take out the enemies' vehicles, man power, and supplies. Due to these bombings, Germany was able to take over the French planes that were abandoned, and increase their air fleet to



be three times the size of Britain's. But in 1934, Britain developed the Hawker Hurricane (shown in the photograph on previous page).

This plane could travel at 340 mph, had 8 guns on the wing that can be covered so they do not freeze at higher altitudes, and a fabric tail end. Many were colored green since planes are most vulnerable to be destroyed while it is sitting on the ground – this one blended in with its surrounding and Britain spread them out so they could not all be destroyed at the same time! Britain also learned to unify their response to defense by using radar; they can see planes coming one hundred at a time.

On December 7, 1941, the U.S. was totally surprised by the Japanese attack on Pearl Harbor. Japan sent two waves of 160 planes each to Pearl Harbor which took out eight US battleships, 180 U.S. planes on the ground and over 2,400 men. It was in April of 1942 that Lt. Col. James H. "Jimmy" Doolittle surprised Japan by leading heavily loaded Army bombers off the short deck of a Navy carrier. Five major cities in Japan, including Tokyo were bombed, and then the bombers flew to China where they were then turned over to the new Air Force units being organized during the time. This proved to the Japanese that they were not invincible, and improved the U.S. morale about the war. During this war, many changes were being made to planes and how and when they flew. For example, dive bombers had flaps on the wings to help with control, the British Night Fighter had better speed, twelve guns mounted on it, and excellent radar. The "Strawberry Bitch," a B-24 (see slide on the right), was a faster, larger plane with four engines and had "tricycle landing gear". Women built these in Detroit at the rate of one an hour, but it received no respect for it was known as the "flying coffin" because fumes came back into the cockpit and made the pilots sick.



Lt. Col. Doolittle also taught his men during this time that the fighter planes should fly ahead of the bombers and serve as a "welcoming committee," rather than just follow along side of the bombers. According to Mr. Strayer, our guide, the best aircraft in WW II was the P-51. Its landing gear was much further apart than other aircraft making landing less dangerous and it shot down more than 4000 German planes in just two months. The plane that ended the war was the U.S. Army Air Forces B-29 bomber that dropped the "Fat Man" nuclear weapon over Nagasaki on August 9, 1945. It was the second atomic weapon used against Japan. The U.S. warned Japan that this was coming if they did not surrender, but the warning was ignored. It took the atomic bomb being dropped on Hiroshima and Nagasaki for Japan to realize it was time to give up.

When World War (WW) II ended, the ideological conflict between Communist and non-Communist countries disagreed over how to govern occupied Germany. This started the Cold War mainly between the U.S., and the Soviet Union. The Soviet Union blocked all surface transportation into West Berlin so that the people could not get supplies needed for survival, including coal, food, and medication. President Truman ordered military planes to fly these supplies into the city. With the help of Britain and France, citizens of West Berlin were able to get these supplies for over a year in order to survive.

Another improvement to aircraft actually occurred during WW II but it was not until the 1950's that stealth technology was actually applied to planes. This allows for the plane to be undetected by radar, thus is not a target for the enemy. The one on display at the museum is only the shell of the plane; it never had an engine in it, and it was used to test the structural integrity of the plane. Space age technology is used to design these planes so that information about the enemy can be gathered without being detected. The future of flight during war is now being developed around UAV's (unmanned aerial vehicles) like the Joint Unmanned Combat Air System (J-UCAS) – shown in the photograph on the right. This aircraft is a joint effort by the Air Force and Navy to utilize during combat missions in the 21st Century.



The last part of the tour took place at the [Presidential](#) and [Research and Development/Flight Test](#) Gallery. In the Presidential Gallery the RET and REU participants were able to walk through many of the planes on display and learn about their history. The first purpose-built US presidential aircraft was “The Sacred Cow.” This was for President Roosevelt in 1944 which could travel at 300 mph and even had an elevator built in since President Roosevelt was wheel chair bound. Another plane on display was the first jet made specifically for use by the President of the U.S., the SAM 26000 (pronounced Sam Two Six Thousand). This plane was built in 1962 for President Kennedy and had the maximum speed of 604 mph. This plane flew President Kennedy to Berlin in 1963 and was the plane that flew him to Dallas, Texas in November of 1963. Compared to the Sacred Cow, this plane was top of the line; it had two kitchens, microwave, TV, a copier and typewriter on board. It was very roomy and comfortable. This plane was where Vice President Johnson was sworn in when President Kennedy was shot, and eventually carried President Kennedy's casket to Washington DC for burial. The photographs below show two of there Presidential planes.



The Sacred Cow, 1944



SAM 26000, 1962

This facility also houses planes that have helped to pioneer aircraft throughout the years and is known as the Research and Development Gallery. A variety of aircraft are housed here for visitors to view, for example, the first aircraft with stealth technology called Tacit Blue. Also on display is a UAV that flew at Mach 3, called Lockheed D-21B which was used to carry out reconnaissance missions over hostile territory. The Chance-Vought XC-142A was designed to investigate the operational suitability of

vertical/short take off and landing transports. This would allow rapid transport of troops and supplies in all weather conditions in a variety of areas. These are shown in the photographs on next page.

The field trip to the National Museum of the United States Air Force in Dayton, Ohio was enjoyed by all RET and REU participants. The museum is open daily from 9:00 AM to 5:00 PM but it closed on Thanksgiving Day, Christmas Day, and New Year's Day. Admission is free and it is suggested that if visitors would like to go to experience the [Presidential](#) and [Research & Development/Flight Test](#) Gallery, early arrive time is best, as this is a first come, first served event and it fills up quickly. There are several tours that visitors can choose to go on, including podcasts and lectures that can be listened to over the computer. For more information or to plan a visit, please see the website for more information <http://www.nationalmuseum.af.mil/index.asp>.



Tacit Blue



Lockheed D-21B



Chance-Vought XC-142A