A Brief History of Aviation Session 2

World War I Aviation



World War I Aviation



European/Asian Air Forces





1911-1919

American Air Service



1917-1919



The First Military Operational Use of Fixed-Wing Aircraft 1911 as opposed to balloons

- During the Italo-Turkish War in Libya in October 1911 Captain Carlo Piazza made history's first wartime reconnaissance flight near Benghazi in a Blériot XI.
- The first aerial bombardment followed shortly thereafter, on 1 November, when Second Lieutenant Giulio Gavotti dropped four bombs on two oases held by the Turks.
- The first aerial photography flight took place later in March 1912, also flown by Captain Piazza.



	Pre WB- 1911	WWI 1911- 1918	1919- 1937	WWII 1938- 1941	WWII 1942- 1945	K/V 1946- 1980	ME 1981- 2000	ME 2001- 2012
Early Aviation 1909 WB-F								
WW I Europeans US	_							
Growth and Expansion		-						
WW II B of B Pearl Harbor Eur. Theater Pac. Theater Atomic Bomb				→ ₩				
Commercial Aviation Jet								
Military Jet Aviation								

Prewar developments

- About 10 years after the Wright brothers made the first powered flight, there was still much to be improved upon just to stay in the air.
- Because of the engine power limitations, effective payload were extremely small.
- Still constructed mostly of hardwood (braced with steel wires) and with linen fabric stiffened by flammable dope to form a wing surface.
- Aside from these primitive materials, the rudimentary aviation engineering of the time meant most aircraft were structurally fragile, and not infrequently broke up in flight especially when performing violent combat maneuvers such as pulling up from steep dives.
- But as early as 1909, these evolving flying machines were recognized to be not just toys, but weapons.

Overview

How did WWI accelerate Aviation?

- From an almost dismissed capability it grew to be 5 to 10 percent of the competing armies.
- Over 145,000 of increasingly capable aircraft were constructed.
- Tens of thousands of pilots, observers and ground crews were trained and organized.
- Air power strategy became an accepted part of warfare and both push and pulled technological advances.

Dueling Prophecies

"The sky is about to become another battlefield no less important than the battlefields on land and sea....In order to conquer the air, it is necessary to deprive the enemy of all means of flying, by striking at him in the air, at his bases of operation, or at his production centers. We had better get accustomed to this idea, and prepare ourselves."

— Giulio Douhet (Italian staff officer), 1909

"Airplanes are interesting toys but of no military value,"

— Marshal Ferdinand Foch (Professor of Strategy, French Ecole Superieure de Guerre) 1911 and Commander of all French Forces in 1918

Statistics/Perspective

 From shortly before the start of WW I in August 1914 to the Armistices in November 1918 over a 145,000 aircrafts of all types and over 200,000 aircraft engines were built by all the belligerents.

Food/Fuel Credos

- An army runs on its stomach
 - Napoleon
- An Air Force run on oil based liquid fuel

- Some unknown sergeant on an early airfield



Allied Fuel Supplies

- England receive oil from their Caribbean colonies particularly Trinidad and Tobago, Persian oil concessions and from the US.
- The French received oil from US (Standard Oil) and Dutch (Royal Dutch Shell) Caribbean sources.
- Italy had some local reserves and from Libya after 1911
- The US was self sufficient from multiple fields.
- The Russians were able to supply all their military ground and aviation fuel needs from their Caspian Sea oil fields.
- The Allies had sufficient national coal supplies.



Central Powers Fuel Supplies

- The Germans obtained oil from Rumania, some fuel through neutral Holland and Russian (Polish Galicia) fields that were overrun in 1914.
- From 1914 to 1916 Rumania was neutral, but supplied Austria - Hungary and Germany with oil. In 1916 Rumania entered the war on the side of the Allies, being promised parts of Hungary, previous fuel exports stopped.
- The Rumanians were invaded, then driven back and the French assisted in destroying the oil fields as they retreated. The Germans reopened the fields in 1917 and pumped 1,000,000 tons of oil in the last year of the war. This kept their war efforts running.
- The Central Powers had sufficient national coal supplies



Europe just Prior to WW I - Empires

Stages of WW | Air Warfare

Air Operations Were Continually Driven by the Need for Intelligence to Breakout of Trench Warfare

- Tethered Balloons
- Reconnaissance/Observation of ground forces
 - Associated with artillery
 - Opponent acknowledgement
- Attack
 - Other observation aircraft
 - Small arms
 - Balloons
- Attack air-to-air
 - Automatic weapons
- Ground Attack
 - Trench Staffing
 - Bombing
 - Tactical attacking opposing airfields
 - Limited strategic

State of the Air War — 1

- By late 1916, two and a half years of continuing and savage fighting had ravaged much of northern France and the Low Countries.
 - A stalemate had descended over the Western Front.
- By January 1917, and after showing early promise, the air campaign that visionaries thought would deliver a knockout blow to the enemy's will to fight, did not materialize and in fact, it was argued that it exacerbated the horrendous stalemate of the trenches.
- Aviation pioneer Orville Wright wrote in December 1916 that "neither side has been able to win on account of the part of the aero plane has played. The two sides are apparently equal in their aerial equipment and it seems to me that unless present conditions can be changed, the war will continue for years!"

State of the Air War — 2

- The only hope Orville saw of ending the war promptly was if the Allied achieve "such overwhelming superiority in the air that the Germans' eyes can be put out"
- But by early 1917, the only real opportunity to accomplish Orville's proposition rested with the United States and in April 1917, that possibility grew with America's entry, with our vast resources, into the "War to End all Wars".

The Blue Max Pour Le Mérite



The award dates back to 1667 when, in the German state of Brandenburg, the Ordre de la Generosite - the Order of Generosity – was created by Frederick William I. Given that French was the language of the royal court the naming of the merit award would have appeared a natural choice.

World War I European Air Forces

- England: Royal Flying Corps
- France: Service Aéronautique,
- Germany: Luftstreitkräfte
- Italy: Aeronautica del Regio Eserciti (Royal Army Air Service)
- Austria-Hungary: Kaiserliche und Königliche Luftfahrtruppen (Emperor's and Royal Air Troops)
- Russian: Imperial Russian Air Force (Императорскій военно-воздушный флотъ) Emperor's Military Air Fleet

European War— Five Fronts All included Aviation

- Western Front: British Commonwealth, French Empire, US vs. Germany
- Eastern Front: Russia, Serbia, Rumania vs. Germany, Austro – Hungarian Empire
 - Russia withdraws in 1917 freeing up large German forces for other fronts
- Italian Austrian Front: Italy vs. Austro Hungarian Empire.
 In 1918 British Commonwealth, French Empire enter
- Southeastern Front: British Commonwealth, French Empire, Greece, Russia vs. Bulgaria
- Middle East Front: British Commonwealth, French Empire, Russia vs. Ottoman Empire



Europe just Prior to WW I - Empires

The Combatants



England



- The <u>Air Battalion</u> of the <u>Royal Engineers</u> (later re-organized as the <u>Royal Flying Corps</u>) was formed in November 1911
- The Royal Flying Corps (RFC) was the over-land air arm of the <u>British military</u> during most of the <u>First World War</u>.
- During the early part of the war, the RFC's responsibilities were centered on support of the <u>British Army</u>, via <u>artillery</u> co-operation and <u>photographic reconnaissance</u>.
- September 1914, during the <u>First Battle of the Aisne</u> the RFC made use of <u>wireless telegraphy</u> to assist with artillery targeting and took aerial photographs for the first time.
- This work gradually led RFC pilots into aerial battles with <u>German</u> pilots and later in the war included the <u>strafing</u> of enemy <u>infantry</u> and <u>emplacements</u>, the <u>bombing</u> of German <u>military airfields</u> and later the <u>strategic bombing</u> of German industrial and transportation facilities near the front.

War Driven Expansion Protect Intelligence Gathering

- The British and French aircraft designs on one side and the German designs on the other side went through continual measure/counter-measure challenges.
- Each attempting to out-perform the other so to retain intelligence gathering capabilities, as the other side attempted to stifle these with more powerful and better armed aircraft.







Sopwith Camel



Bristol Fighter 23

SE5



Royal Air Force



- On 1 April 1918, the RFC and the RNAS were amalgamated to form a new service, the <u>Royal Air Force</u> (RAF).
- The RAF was under the control of the new <u>Air</u> <u>Ministry</u>.
- After starting in 1914 with some 2,073 personnel, by the start of 1919 the RAF had 4,000 <u>combat aircraft</u> and 114,000 personnel.

France

- France's embryonic Army Air Service (Aviation Militaire), which eventually became the <u>Armée de</u> <u>l'Air</u>, was instituted late in 1910
- The French took active interest in developing the air force from 1909 and had the first World War I fighter pilots.
- France led the world in early aircraft design and by mid-1912 the Aéronautique Militaire had five squadrons (escadrilles).
 - This had grown to 132 machines (21 *escadrilles*) by 1914, the same year when, on 21 February, it formally came under the jurisdiction of the Ministry of War

Armée de l'Air

- The 1916 air battle over Verdun was the first large scale air battle ever fought. With French observation and reconnaissance aircraft threatened by whole squadrons of German fighters.
- After several weeks of intense air fighting, the French slowly regained air superiority over Verdun. Verdun can also be remembered as the birth of command and control of air power in air warfare.
- Before US entry, a squadron of mostly American volunteers flew on behalf of the French, the Lafayette Escadrille (first designated N.124 and later SPA.124).

Armée de l'Air

- By April 1917, the *Aéronautique Militaire* had 2,870 aircraft comprising 60 fighter and 20 bomber squadrons and 400 observation planes, yet, by October 1917, expansion to over 300 squadrons was being proposed.
- By May 1918, over 600 fighters and bombers came under the command of the so-called *Division Aérienne*.
- Two months later, July 1918, long-range reconnaissance squadrons had been formed, based in part on tactics invented by the American Fred Zinn, who was a pioneer of aerial photography.

Armée de l'Air

- At the armistice, the Aéronautique Militaire had some 3,222 front-line combat aircraft on the <u>Western Front</u>, making it the world's largest airforce in air strength.
 - During the war the Aéronautique Militaire claimed 2,049 enemy aircraft & 357 balloons destroyed, for some 3,500 killed in action, 3,000 wounded/missing and 2,000 killed in accidents.
 - Some 182 pilots of the Aéronautique Militaire were deemed <u>flying aces</u> for having scored five or more air-to-air victories.



Nieuport 28 Fighter







Caudron G.4 Bomber

SPAD Reconnaissance

Germany: Luftstreitkräfte Imperial German Army Air Service



- The first <u>military aircraft</u> to be acquired by the German Army entered service in 1910 - forming the nucleus of what was to become the *Luftstreitkräfte* in October 1916.
- During the war, the Imperial Army Air Service utilized a wide variety of aircraft, ranging from fighters (such as those manufactured by <u>Albatros-Flugzeugwerke</u> and <u>Fokker</u>), reconnaissance aircraft (<u>Aviatik</u> and DFW) and heavy bombers (<u>Gothaer Waggonfabrik</u>, better known simply as Gotha, and Zeppelin-Staaken) and <u>airships</u> of all types.

Germany: Luftstreitkräfte Imperial German Army Air Service

- The fighters, however, received the most attention in the annals of military aviation, since it produced high-scoring "aces" such as <u>Manfred von Richthofen</u>, popularly known in English as "The Red Baron" (in Germany, he was known as "*der Rote Kampfflieger*" [Red Air Fighter]), <u>Lothar von Richthofen</u>, <u>Ernst Udet</u>, <u>Hermann Göring</u>, <u>Oswald Boelcke</u>, <u>Werner Voss</u>, and <u>Max Immelmann</u> (the first airman to win the <u>Pour le Mérite</u>, Imperial Germany's highest decoration for gallantry, as a result of which the decoration became popularly known as the "Blue Max").
- Like the German Navy, the German Army also used <u>Zeppelin airships</u> for bombing military and civilian targets in France, Belgium and the United Kingdom.

Germany: Luftstreitkräfte Imperial German Army Air Service

- By the end of the war, the German Army Air Service possessed a total of 2,709 frontline aircraft, 56 airships, 186 balloon detachments and about 4,500 <u>flying personnel</u>.
- Casualties totaled 8,604 aircrew killed/missing/prisoner, 7,302 wounded, and 3,126 aircraft, 546 balloons and 26 airships destroyed.
- Some 5,425 Allied aircraft and 614 kite/balloons were claimed destroyed.
- After the war ended in German defeat, the service was dissolved completely on 8 May 1920 under the conditions of the <u>Treaty of Versailles</u>, which demanded that its airplanes be completely destroyed and its organizations dismantled.



Gotha G.V. German bomber, 1917



Anthony Fokker

- Fokker designed many aircraft for the Imperial German Army Air Service (<u>Luftstreitkräfte</u>), including the <u>Fokker Eindecker</u> and the <u>Fokker Dr.I</u>, the tri-plane made famous in the hands of aces such as <u>Manfred von Richthofen</u> (the Red Baron).
- Fokker delivered about 700 military planes to the German air force.
- Fokker is often credited with having invented the <u>synchronisation</u> <u>device</u> which enabled <u>World War I</u> aircraft to fire through the spinning <u>propeller</u>. Fokker's <u>pushrod</u> control mechanism, *Gestängesteuerung*, allowed the aircraft's forward-firing <u>machine</u> <u>gun</u> to fire only when the propeller was out of the line of fire.
- As incorporated into the famous Fokker *Eindecker* its use directly led to a phase of German air-superiority known as the <u>Fokker</u> <u>Scourge</u>.



WW I was known for mud, even the Aircraft could not escape it





Fokker D.1 Tri-wing

Manfred von Richthofen's Albatros D.V


Italy



- Italy made the first Military Operational Use of Fixed-Wing Aircraft in 1911 in Libya.
- In 1914 equipped with fourteen fully manned and equipped squadriglie fitted with French Nieuports, Blériot and Murice Farmans; Italy initially more than hold its own against an undermanned, under trained and under equipped Austro-Hungarian air force.



Europe just Prior to WW I - Empires



Italian Austrian Front

Red line Italian advances into Austria Yellow line 1918 Austrian/German final push into Italy

Italian-Austrian Front

- Limited air reconnaissance occurred over the Alps as both sides were in caves and terraces
- The land and air war east of Venice waged back and forth based on the deployment of Austria and German Forces elsewhere. As the war progressed, Austrian Air units were eventually provided better aircraft.
- Italian aircraft improved in like terms
- When Russia collapsed in 1917, German units reinforced the Austrians. The Allies rushed ground and air units to Italy from France and eventually prevailed.
- Air war had only secondary effects on the outcome.
- The Italians did predominate in the Adriatic with their Naval amphibian





Caproni bomber

Ansaldo SVA Reconnaissance Bomber Fuselage constructed of plywood



Macchi M5, Flying Boat



Europe just Prior to WW I - Empires



Eastern Front North

Russia initially pushed Into Prussia and Austria-Hungary

Orange early German Advances, 1915 Green line final German Advance, 1917.

1917 Armistice frees significant German Forces for Western Front

Eastern Front South 1916-on

Austria- Hungary vs. Rumania/Serbia Limited Air actions 43



- Although all of the European powers were unprepared for modern air warfare in the beginning of the conflict, Austria-Hungary was one of the most disadvantaged due to the empire's traditionalist military and civilian leadership combined with a relatively low degree of industrialization.
- The Austro-Hungarian Air Force was embryonic in 1914 with a few German built planes having been added to the Army balloon service in 1913, but was to see marked expansion during the early years of the war.



- When WWI erupted there was only a single aircraft builder, Lohner. Lacking the industrial capacity of Germany, Austro-Hungary's aviation did not develop as rapidly prior to, or during, the war.
 - Prewar investment of the two powers: Austria-Hungary spent the equivalent of \$318,307 on military aviation in 1914,whereas German investment that same year was \$14,836,726. [10 x 1]
 - Despite the inauspicious start, however, Austro-Hungarian achievements were impressive.

- During the war, another eight companies, some German, had joined Lohner.
- Austria-Hungary, like its German ally, was forced to fight on multiple fronts: Russia and Rumania to the east, Serbia in the south and Italy to the southwest.
- Its position was complicated even further by the diverse and stratified society that populated the Dual Monarchy, where 14 different languages were spoken. There was a 200 word German military vocabulary.



 Like its German counterpart, the Luftfahrtruppe did not survive the Armistice.
With the collapse of the Habsburg Empire and the end of the war, Austria-Hungary was obliged to dismantle its air force.







Aviatik D.I

Austro-Hungarian Fighters





Hansa-Brandenburg C.I/G.1 Reconnaissance/Bomber

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Early Aviation 1909 WB-F								
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Military Jet Aviation								



Imperial Russian Air Force

- Imperial Russian Air Force (Императорскій военновоздушный флотъ, Emperor's Military Air Fleet) existed in the Russian Empire between 1910 and 1917.
- At the beginning of WW I, the Imperial Russian Air Force was second only to France in size, although a significant part comprised used outdated French aircraft.
- Initially, Russians used aviation only for reconnaissance and coordination of artillery fire, but in December 1914 a squadron of Ilya Muromets bombers was formed and used against the German and Austro-Hungarian armies.

Early Russian Aviation History

- In 1904 <u>Nikolai Zhukovsky</u> established the world's first <u>Aerodynamic</u> Institute in Kachino near <u>Moscow</u>.
- In 1910 the <u>Imperial Russian Army</u> purchased a number of French planes and began training their first military pilots. The history of military aircraft in Imperial Russia is closely associated with the name of <u>lgor</u> <u>Sikorsky</u>.
- In 1913 Sikorsky built the first four-engine <u>biplane</u>, the <u>Russky Vityaz</u>, and his famous <u>bomber aircraft</u>, the <u>Ilya Muromets</u>.
- In the same year <u>Dmitry Grigorovich</u> (of MI<u>G</u> fame) built a number of "flying boats" for the <u>Imperial Russian Navy</u>.
- In 1914 Russian aviators conducted the first ever <u>flights in the Arctic</u> looking for the lost expedition of polar explorer <u>Georgy Sedov</u>.



The Ilya Muromets was designed by Igor Sikorsky as the first ever airliner, but was turned into bomber for the Imperial Russian Air Force.



Dmitry Grigorovich built a number of "flying boats," here the MI-6, 1915 for the Imperial Russian Navy.

Imperial Russian Air Force

- Among Russian pilots were the legendary <u>Pyotr Nesterov</u>, who performed the first <u>aerial ramming</u> plane attack in the history of aviation (survived), and the most successful Russian <u>flying ace</u> and fighter pilot <u>Alexander Kazakov</u>, who shot down 32 enemy planes.
- In 1915 the Imperial Russian Air Force, formerly part of the <u>Engineer Corps</u>, became a separate branch of the army directly under command of the <u>Stavka</u> (commander-in-chief's HQ).
- However, the war was not going well for Russia and following significant setbacks on the <u>Eastern front</u>, and the economic collapse in the rear, military aircraft production fell far behind Russia's rival Germany. Between 1914 and 1917 only about 5000 planes were built in Russia compared to more than 40,000+ in Germany.

Imperial Russian Air Force

- In late 1916 Sikorsky built a unique four-engine bomber-biplane called <u>Alexander Nevsky</u>, but it was never put to serial production due to the events preceding and following the <u>October</u> <u>Revolution</u>, and Sikorsky's <u>emigration</u> to the <u>United States of America</u> in 1919.
- The Imperial Russian Air Force <u>seaplanes</u> <u>hangars</u> in <u>Tallinn</u>, Estonia harbor were some of the world's first <u>reinforced concrete</u> structures.



Europe just Prior to WW I - Empires





Not to Be Overlooked: In the WWI the Middle East Backwater The Ottoman Empire

- In 1912 eight Turkish Army pilots were trained in France*
- The French delivered two aircraft used to train more air crews in-country
- Additional aircraft were purchased 1914; the Naval Air School was established in Istanbul

In 1915, a group of German and Turkish aviators were exchanged between the respective Air forces. Germany provided obsolescent aircraft.

•The army and naval aviation were united in May 1916. Often Turkish and German aviation personnel were jointly stationed. Turkish Air Force operated over a very large area from Çanakkale to Hejaz, from Caucasia to Palestine and provided mostly artillery spotting on the Russian and British fronts.

• In July 1918 Istanbul, was occupied by the allied powers and the Ottoman Empire signed the Moudhros Armistice on 30 October 1918.

* By 1912 the French have Trained over 800 pilots

Ottoman Air Force Resources

- Older/obsolete French aircraft
- Older German aircraft
- Training shortfalls
- Maintenance shortfalls
- But, the Ottomans had fuel from what is now Iraq. Prospected for and developed by the Germans in the early 1900s



World War I American Expeditionary Force United States Army, Signal Corp, Air Service US Navy Air Units US Marine Corps Air Units



"Prop and Wings" branch insignia of the Air Service





US World War I Air Service

- Pre-World War I
- Early operations
- Full involvement
- A Preview of the Arsenal of Democracy
- US Air Service by the Numbers
- US Army Aviation Combat
- US Navy Operations
- US Marine Corps Aviation Combat
- Post Armistice Drawdown

US Army Air Service Prior to WWI

Active	July 18, 1914–May 20, 1918. Air Service went through a number of organizational and name changes during and after the war
Role	Aviation support (liaison and observation)
Size	44 officers, 224 men, 23 aircraft (1914)
Part of	Office of the Chief Signal Officer <u>U.S. Army Signal Corps</u>
First action	Mexico, 1916, pursuit of Panhco Villa

1914 We Were Neutral, but Started Preparing



- Curtiss JN-1/4 "Jenny"
- Twin-seat dual control biplane
- Student in front, instructor in back

- Introduced in 1915, probably North America's most famous WW I aircraft.
- Widely used to train > 95% of beginning pilots.
- Its tractor prop and maneuverability made it ideal for initial pilot training
- A 90 HP Curtiss OX-5 V8 engine provided:
- Top speed of 75 miles per hour
- Service ceiling of 6,500 feet.

Curtiss JN-4 "Jenny" Underwent continual improvement



Top speed: 75 mph (121 km/h) Length: 27' 4" (8.33 m) Introduced: 1915 Manufacturer: Curtiss Aeroplane and Motor Company Designer: Glenn Curtiss



Inauspicious Start-

General Pershing's Search for Pancho Villa

- In 1916, the Signal Corps Aviation Service only had a few crude aircraft. The 1st Aero Squadron assigned to support Pershing was equipped with six early Curtiss JN-2 "Jennies" which had a reputation of being unstable deathtraps.
- The air service pilots were mostly inexperienced.
- Pershing was barely a month into the expedition and lost all six aircraft. Two crashed within the first week of the expedition.



Lafayette Esquadrille

- Established in 1916 by the French to coax America into dropping neutrality. Glamorized its pilots exploits.
- Esquadrille No. 124. It had about 40 American and a few other nationalities at any one time.
- All told 225 Americans passed through its ranks.
- Built up a lot of myth. The Germans complained diplomatically.
- It was incorporated into the Army Air Service in early 1918

Full American Involvement

- The US entered the War in April 1917
- First a build-up.
- By 1918 the US involvement was increasing.

 While American volunteers had been flying in Allied squadrons since the early years of the war, not until the Spring of 1918 did all-American squadrons begin patrolling the skies above the trenches.

• At first, the Air Service was largely supplied with second-rate weapons and obsolete aircraft, such as the <u>Nieuport 28</u>.

• As American numbers grew, equipment improved, including the <u>SPAD S.XIII</u>, one of the best French aircraft in the war.

 American assembled, British designed DeHavilland DH-4, using Packard/Ford Liberty engines were used by the Navy and Marine Corps for patrolling and bombing.



Aircraft used by US in WWI

French Nieuport 28



French SPAD S XIII

British De Havilland DH-4, assembled in US with 400 hp US Liberty engine



A Preview of the Arsenal of Democracy

- In July 1917, the House passed the largest, single item appropriation bill (\$ 640,000,000) in the country's history.
- Unfortunately for the Allies, no amount of money was able to cover the fact that the US's aircraft industrial base was unable to mass produce the numbers of aircraft the Bill intended.

A Preview of the Arsenal of Democracy – Air Production Board

- Even with the decision to manufacture only European designs, America's industries were inadequately set up for the task. This was a daunting problem for an industry that had only produced 87 airplanes the previous year, 1916.
- The US was years behind Europe. Something "must be done" said a surprised President Wilson. In the spring of 1917, the President appointed Howard E. Coffin to head a committee for the mobilization of the nation's resources towards mass production of aircraft and its systems – Air Production Board

APB - Mass Production of Aircraft and Systems

- Spruce regiments
- Suspension of all aircraft design litigation
- Consolidation of aircraft production to a number of centralization locations modeled on auto assembly plants
- Design reviews to adapt aircraft assembly to auto assembly lines processes
 - Task partition to lessen required skill levels
 - A single engine design, the Liberty engine
 - 12 Cylinder, water cooled, 400 HP, standard mounting

There was much to be learned, time was short and success was incomplete

US Air Service by the Numbers-1

- By November 11, 1918, the Air Service both overseas and state side had 195,024 personnel (20,568 officers; 174,456 enlisted men) and 7,900 aircraft, constituting five per cent of the United States Army. 32,520 personnel served in the Bureau of Aircraft Production and the remainder in the Division of Military Aeronautics.
- French combat aircraft (purchased), British designs (assembled) and and US trainer aircraft (built)
- Of combat aircraft assembled in America, the <u>de Havilland DH-4B</u> (3,400) was the most numerous, although only 1,213 were shipped overseas, and only 1,087 of those were assembled, most used in observation units.
- The Air Service commissioned over 17,000 reserve officers. More than 10,000 mechanics were trained to service the American aircraft fleet.
US Air Service by the Numbers-2

Out of nowhere: Air Service facilities state side totaled 40 flying fields, 8 balloon fields, 5 schools of military aeronautics, 6 technical schools, and 14 aircraft depots. 16 additional training schools were located in France, and officers also trained at three schools operated by the Allies.

 American Expeditionary Force overseas air arm totaled 78,507 (7,738 officers and 70,769 enlisted men) at the armistice. Of this total, 58,090 served in France; 20,075 in England; and 342 in Italy. Balloon troops made up approximately 17,000 of the Air Service, with 6,811 in France, conducting and supporting the dangerous duty of spotting for the artillery at the front.

US Army Aviation Combat (1918)-1

- Took about a year to get into combat
- American flyers got their first taste of combat in a relatively quiet sector around Toul (spring 1918). This saw all-American squadrons patrolling the skies above the trenches for the first time.
- This coincided with the Germans Spring offensive which failed, although by a very narrow margin.
- The AEF was deployed for the first time in force with the fight for Chateau-Thierry during the Aisne-Marne offensive. The USAS deployed 13 squadrons to support the ground forces (early June). When the Germans stopped, the Allied launched the 100 Day Offensive that would win the War.

US Army Aviation Combat (1918)-2

- First major independent AEF operation the St. Mihiel salient . The AEF attacked (12-16 September, 1918).
- US Gen. Billy Mitchell commanded 1,481 allied aircraft vs. 500 German aircraft. This was the largest concentration of Allied air power during the entire War.
- Almost half the force was American. Air operations were hampered by poor weather.
- Even so, the massive AEF air force seized control of the air over the battlefield. German balloons were shot down and German airfield staffed. AEF bombers hit targets at the front as well as rear areas.



Europe just Prior to WW I - Empires



Western Front

Each block represents 50,000 troops

It moved 50 miles in Four years of fighting



12 September 1918



16 September 1918

US Army Aviation Combat (1918)-3

- The USAS supported ground forces in what proved to be the war-winning Meuse-Argonne Offensive (September 26 – 11 November).
- Mitchell continued his tactic of massed air power. The pitched battles and supply problems reduce the USAS to 45 squadrons with 457 serviceable aircraft. This was almost 200 fewer planes than at the beginning of the campaign.
- At this point the German Army finally asked for an Armistice ending the War.
- Massed air power too limited to be proven
 - It would take an other 25 years
- American flyers dropped 140 tons of bombs in 150 bombing runs. They participated in seven campaigns and shot down 781 enemy planes and 73 balloons.
- The US lost 289 planes and 48 balloons and 237 men.



US Naval aviation in WWI

- The first American flyers to reach Europe was a naval air detachment. They began flying seaplane escort for French coastal convoys (September 1917).
- The Navy eventually deployed some 900 seaplanes for convoy duties, 400 of which were stationed abroad at 27 U.S. naval air stations from Ireland to Italy. A few naval aviators flew DH-4 equipped as bombers from Calais and Dunkirk.



US Marine Aviation in WWI

- Marine aviation personnel served in France as the Day Wing of the Northern Bombing Group of the Navy.
- The Day Wing carried out 14 independent raids flying DH-4s far behind the German lines, and brought back valuable information.



 While in Europe, the Marine fliers served with Squadrons 213 (pursuit squadron), 217 and 218 (bombing squadrons), Royal Flying Corps of England, and with pursuit, observation and bombing squadrons of the French Flying Corps.

US Wartime/Peacetime Air Unit Build Up_Draw Down

- Size (1914): 268 men; 23 aircraft in US
- Size (1918): 195,024 men; 7,900 aircraft in US/Overseas
- Size (1926): 9,954 men; 1,451 aircraft in US

A lot of aircraft per size of the service, but few dollars for fuel and maintenance of an alreadyobsolescent fleet.

WWI Summary

Military needs Drove Designs

- Carrying capacity
- Power
- Reliability
- Ruggedness
- Endurance
- Radios
- Parts and assembly standardization
- Standard flying techniques and training

Four Years of significant Aeronautical Engineering and Manufacturing Driven by Wartime Needs. 1914 through 1918



Eindecker – Wood and Cloth Open Cockpit Wires and Struts



Albatros D.Va – Formed Plywood Enclosed Cockpit. Minimal Wing Support



Junkers J2 – Aluminum Enclosed Cockpit Cantilevered Wing

Approximate Aircraft Production Summary by all Combatants

- French built ≈ 45,000 aircraft and ≈ 70,000 engines. Many engines were supplied to the British.
- The British built ≈ 35,000 aircraft and ≈ 20,000 engines. The French made up the difference.
- The Germans built ≈ 45,000 aircraft and ≈ 55,000 engines for their use and by the Austrians.
- The US built ≈ 9000 trainers and combat aircraft but built ≈ 40,000 Liberty engines.
 - Engines came from auto assembly plants.
 - Aircraft assembly was a new enterprise.

WWI Summary

- WWI was a war of massed land armies.
- Aviation had limited effect on the ultimate conduct and end of the war.
 - The British, French and Germans were the prime players and technically advanced the most
 - The US, Italy, Austria-Hungary, Russia and the Ottoman Empire were secondary
 - Air power's major contribution was reconnaissance
- To those military visionaries who could foresee aviation advances: the Blitz and Strategic heavy bombardment portended a different story.