

3D PRINTING GREAT WAR AIRCRAFT INGENIUM ARTIFACTS



GREAT WAR AIRCRAFT



A.E.G. G.IV:

Artifact no. [1967.0631.001](#)

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Royal Aircraft Factory B.E.2C:

Artifact no. [1967.0688.001](#)

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Bristol F.2b:

Artifact no. [2006.0022.001](#)

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Sopwith Triplane (Replica):

Artifact no. [1967.0693.001](#)

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Nieuport 12:

Artifact no. [1967.0685.001](#)

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Sopwith Pup (Replica):

Artifact no. [1973.0657.001](#)

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[3D Educational Resources – Aircraft: A 3D Exploration of the Design and Colouration of First World War Airplanes](#)

The First World War (or the Great War, as it was known at the time) was the first war in which aircraft had a major impact. Aircraft filled many roles in the skies over the Western Front, including reconnaissance (spotting enemy troops and positions), bomber (dropping explosives on enemy forces), and fighter (shooting down enemy aircraft).

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The aircraft types shown above all filled one or more of those roles during the latter part of the First World War, from 1916 to 1918, including the Battle of Vimy Ridge on April 9, 1917.

CONNECTING AND RELATING

- Have you ever flown in an aircraft? Did you enjoy the experience?
- Have you ever flown in an open-cockpit aircraft? Did you enjoy the experience?
- How would it be different flying in an open-cockpit aircraft compared to flying in an airliner?
- Have you ever looked down at the ground from an aircraft? How did that perspective make you think differently about your world?

ENGAGING WITH THE ARTIFACTS

Historical Significance

- Many fighter pilots became famous during the First World War. The press glamorized them as “knights of the air,” and the public followed their exploits. Name three famous Canadian fighter pilots from the First World War (e.g., Billy Bishop, Roy Brown, William Barker, Raymond Collishaw, Wilfrid “Wop” May) and research their exploits.
- In the First World War, more than 20 000 Canadians flew in combat with the British armed services, but there was no separate Canadian Air Force, nor were there any Canadian-built aircraft used in combat during the First World War. How important do you think the Canadian contribution was to the air war in the First World War? Do you think that Canada should have had its own air force during the First World War instead of being part of the Royal Flying Corps, Royal Naval Air Service, and Royal Air Force?

Relating Science and Technology to Society and the Environment

- In August 1914, Sir Sam Hughes, Canada’s Minister of Militia and Defence, wrote:

The aeroplane is an invention of the devil and will never play any part in such a serious business as the defence of the nation, my boy!

Many other military leaders at the beginning of the First World War felt similarly. Can you think of any other examples of new technologies whose importance many people at the time did not understand? Can you think of any new technologies now that might transform our world?

Exploring Concepts

- What materials were most World War I aircraft made from compared to modern aircraft? (*Mostly wood and fabric compared to metals and composites on modern aircraft.*)
- Most biplanes and triplanes have many wires and struts connecting their wings, tail, and fuselage. What were the purposes of these devices? (*Many wires were used for controlling the aircraft, while other wires and struts were used to provide structural strength and stability.*)
- Wing loading is the ratio of an aircraft’s mass to its wing area. Wing loading can be calculated by dividing the mass of the aircraft by the area of the upper surface of its wings:

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$$\text{wing loading (kg/m}^2\text{)} = \text{mass (kg)/wing area (m}^2\text{)}$$

Calculate the wing loading for these aircraft:

Aircraft	Loaded Mass	Wing Area	Power	Wing Loading	Power-to-Weight
A.E.G. G.IV	3 630 kg	67 m ²	520 hp (2 x 260 hp engines)		
Bristol F.2b	1 474 kg	37.62 m ²	275 hp		
Nieuport 12	850 kg	22 m ²	110 hp		
B.E.2C	1 068 kg	34.8 m ²	90 hp		
Sopwith Triplane	700 kg	21.46 m ²	130 hp		
Sopwith Pup	557 kg	23.6 m ²	80 hp		

In general, aircraft with lower wing loading can climb faster, are more maneuverable, and can take off in a shorter distance, while aircraft with higher wing loading are more stable in flight and can carry larger loads.

An aircraft's power-to-weight ratio is the ratio of the maximum power an aircraft's engines can produce to its mass. Power-to-weight can be calculated by dividing the maximum horsepower of an aircraft by its mass:

$$\text{power-to-weight (hp/kg)} = \text{power (hp)/mass (kg)}$$

Calculate the power-to-weight for the aircraft in the chart above.

In general, aircraft with a higher power-to-weight ratio can climb faster, accelerate more quickly, and are more maneuverable.

Which of these aircraft do you think would make good fighters? (*Fighters needed to be maneuverable and climb quickly.*) Which of these aircraft do you think would make good reconnaissance aircraft or bombers? (*Bombers and reconnaissance aircraft needed to be stable while dropping bombs or taking photographs, and they also needed to be able to carry larger loads.*) (*The Sopwith Triplane and Sopwith Pup were fighters, the Bristol F.2b was a fighter and reconnaissance aircraft, The Nieuport 12 was a reconnaissance aircraft, the B.E.2C was a reconnaissance aircraft and light bomber, and the A.E.G. G.IV was a bomber.*)

Nature of Technology

- Many technologies, like aircraft, have been applied to war and rapidly developed for military purposes, despite the wishes of their inventors. Do you think it is possible to develop a technology for peaceful purposes only?



ADDITIONAL REFERENCES

- [Activity 1: Learn About Flight](#)
- Activity 2: Markings and Colours of First World War Planes [[download PDF](#)] [[download photos](#)]