MARKINGS AND COLOURS OF FIRST WORLD WAR PLANES

During the First World War, aircraft were painted in certain colours and patterns for specific reasons. In this activity, students will be able to explore how planes were coloured in the First World War.

ONTARIO CURRICULUM LINKS

Through this activity, your students will discover the benefits of plane camouflage and markings during the First World War. This activity can be connected to multiple aspects of the Ontario School Curriculum, our suggested link is:

- Grade 10 History, Canadian History since World War 1 (Canada, 1914 – 1929)

MATERIALS

1 - Blender™ software
1 - Blender files for First World War planes

1 - Computer
1 – Data projector

*Note: In this activity, we are using Blender to colour the 3D plane models, but you can use another program of your choice for this task. This activity uses Blender in a very simplified and limited way. Feel free to explore (or have your students explore) the many other things Blender can do.

Grades
5 – 11

Age Range
10 – 16 years

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INSTRUCTIONS

In this activity, you will be modifying the 3D plane models in front of your students using a computer and a data projector. Students can also do this activity using their own computers.

There is also a video that goes through the instructions found below. You can find this video at ingeniumcanada.org/ingenium/museums/education/3D-aircrafts.php.

To Install Blender on PC or Mac:

1. Download Blender from blender.org/download/.
   a. Choose the version that corresponds to your operating system.
   b. For PC, both the .zip format and the .msi format are fine.
   c. For Mac, you will be downloading a zip file.
2. Install the program
   a. If you are using a PC, once the file has been downloaded, either unzip the file (if you downloaded the .zip format) or double-click on the file to install the program (if you downloaded the .msi format).
   b. If you are using a Mac, your browser may automatically unzip the file after it has been downloaded. If this did not occur, then you need to unzip the file.
3. Now you are ready to use Blender.
   a. If you are using a PC and chose the .zip format, go to the folder containing the unzipped files and double-click on "blender.exe" to run the program. If you chose the .msi format, you can run the program from your Programs menu.
   b. If you are using a Mac, go to the folder containing the unzipped files and double-click on "Blender". The program should launch automatically.

**Colouring the models using Blender:**
Note: The instructions below assume that you have either a 3-button mouse or a keypad on your keyboard. If you do not have either of these features, you can find information on how to emulate them at: docs.blender.org/manual/en/dev/preferences/input.html. To get to the Input page the webpage is referring to, click on "File", "User Preferences" and then "Input".

1. Download the zipped Blender files of the aircraft you want from ingeniumcanada.org/ingenium/museums/education/3D-aircrafts.php. Unzip the files–there should be three (.blend, .blend1 and .png)–and place them all in the same folder.
2. Load one of the .blend files into Blender.
3. Ask your students what colour(s) they think the plane should be, and what markings it should have. Ask them to explain why. Then make the changes on the plane model.

A few hints on colouring the model:

a. To paint, select a colour from the colour wheel on the left of the screen with the left mouse button and use the left mouse button to add colour and markings to the 3D model of the plane.

b. The black-to-white vertical column to the right of the colour wheel can be used to lighten or darken the colour.

c. The "Radi" input row can be used to change the size of your brush.

d. You can paint over previously painted colours. For instance, if you paint a wing blue, but your class decides they want it green, just select green and paint over the blue.

e. To move across the screen (i.e., to move the image left, right, etc.), hold down the "Shift" key and the middle mouse button and move the mouse in the direction you want to move. If you do not have a middle mouse button, you can hold down the "Ctrl" key, then move around using the "4", "6", "8" and "2" on your numerical key-pad for left, right, up and down respectively.

f. To rotate the 3D model, hold down the middle mouse button and move the mouse in the direction you want to rotate the image. If you do not have a middle mouse button, you can rotate the image using the "4', "6", "8" and "2" on your numerical key-pad for left, right, up and down rotation respectively.

g. To zoom in and out of the image, you can use the scrolling wheel on your mouse. If you do not have a scrolling wheel, you can use the "+" and "-" on your numerical key-pad.

4. To save changes you made in the previous step:

a. Click on the "Editor Type" selector, found in the bottom left hand corner of the screen (highlighted with the red circle in the image below).
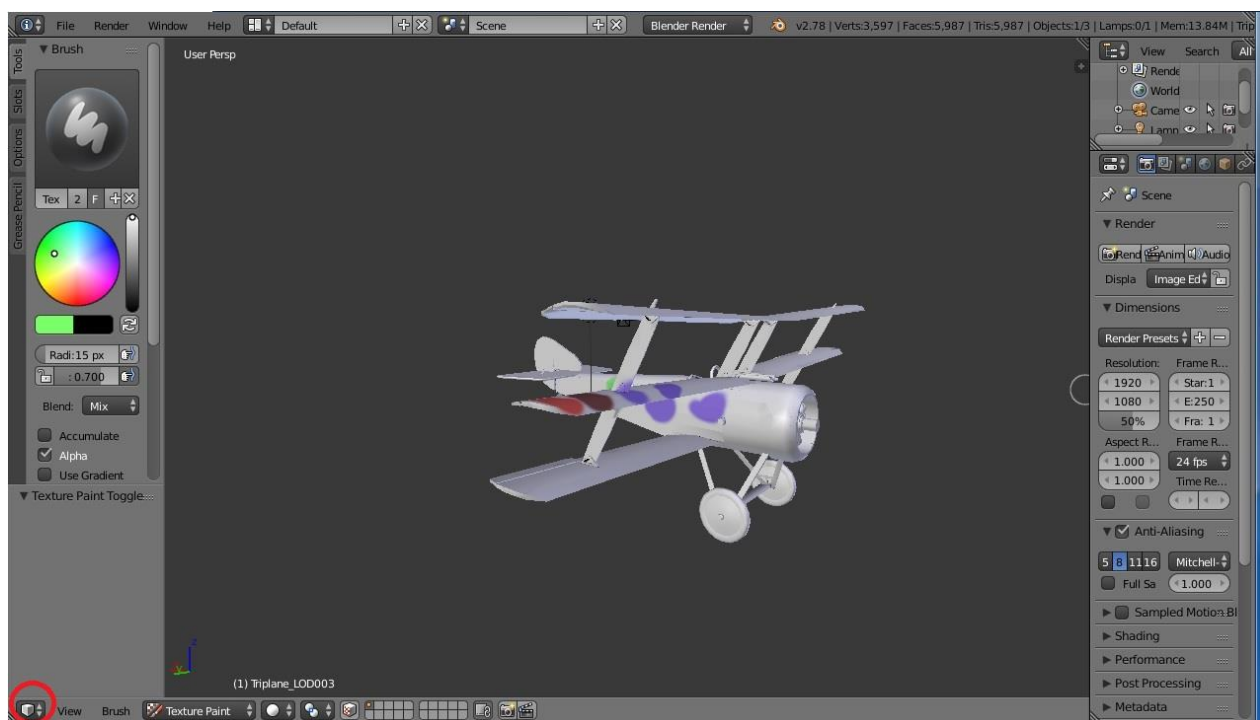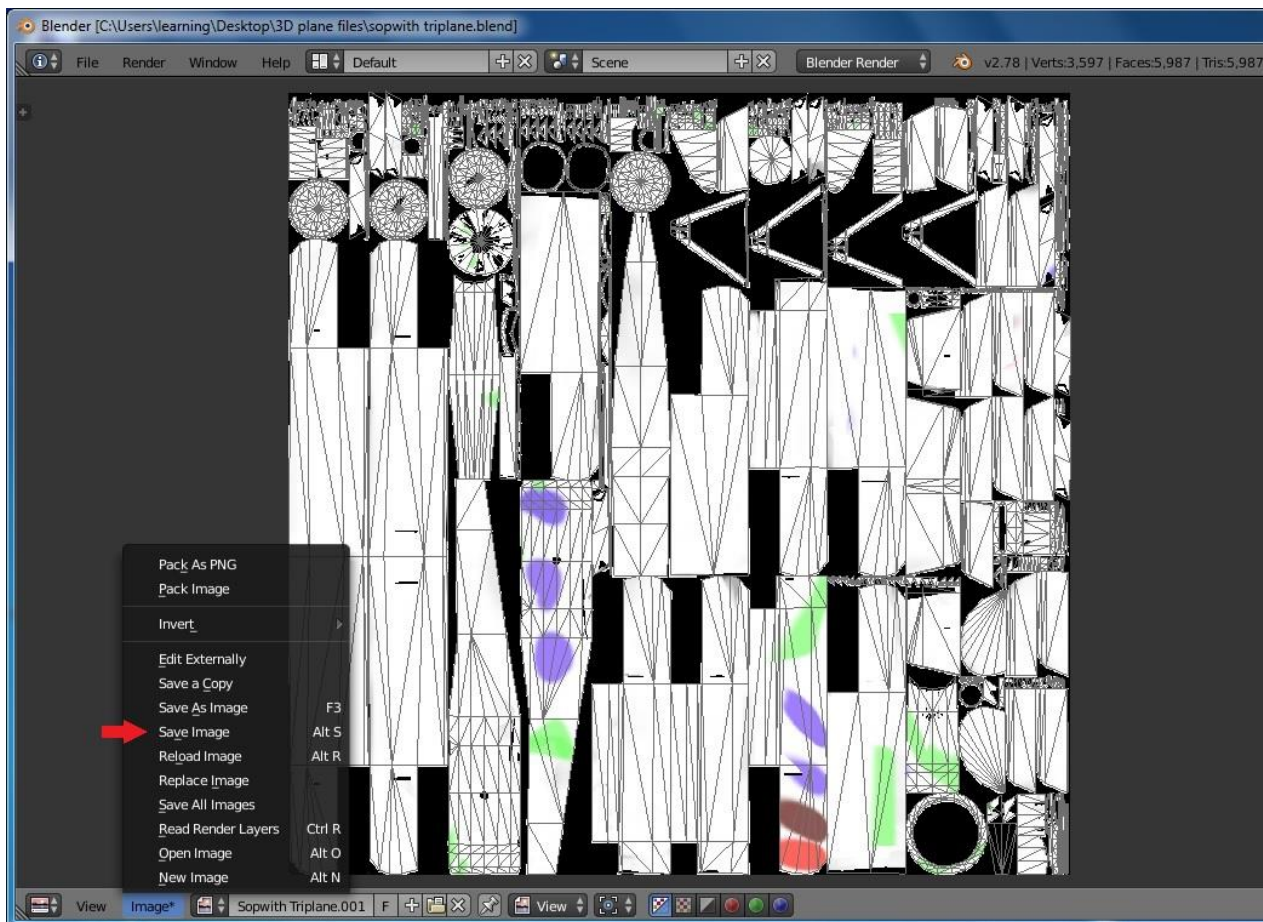
b. Select "UV/Image Editor".
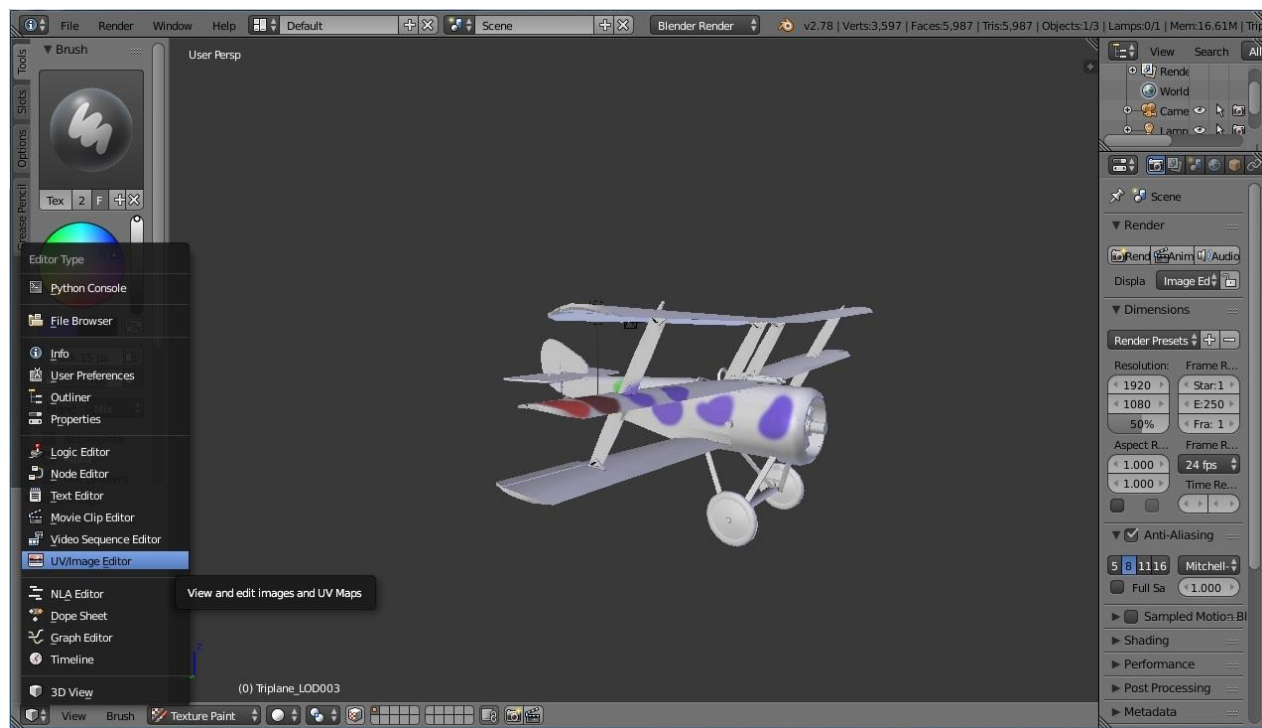
c. Click on "Image", found near the bottom left corner.
d. Click on "Save image" (highlighted with the red arrow in the image below).

e. Click on the "Editor Type" selector again and select "3D view" to return to the original view.
f. Click "File", in the top left corner, and click on "Save".
5. Show your students the images of the actual aircraft and discuss why planes were coloured a certain way. You can find the PDF file with these photos at ingeniumcanada.org/ingenium/museums/education/3D-aircrafts.php.

Note the B.E.2c reflects a restoration aimed at allowing Museum visitors to see how First World War aircraft were constructed. Additional information about plane camouflage and markings during the First World War can be found below.

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EXPLANATION

PLANE CAMOUFLAGE AND MARKINGS DURING THE FIRST WORLD WAR

In the early days of the First World War, aircraft did not play a large role, serving mainly as a means of observing the enemy's front lines. As a result, there was not much need for camouflage and planes were a fairly noticeable pale yellow, due to the use of "dope" (a type of varnish) on their canvas surface. As the role of airplanes evolved to include such tasks as dogfights and bombing runs, camouflage became a necessity.

Camouflage patterns for planes were not universal, and the Allies and the Germans took somewhat different approaches. An example of the approach used by the Allies can be seen on British aircraft. These planes had one dominant colour, generally ranging from greenish-ochre to chocolate brown.

The exact appearance of the plane also depended on its role. For instance, the Bristol F.2B was a fighter that flew missions during the day. In Images 1a and 1b you can see that the top of the plane was painted a dark-green, while its underside was a lighter colour. The reason for this was because of the point of view of an observer/attacker. When the plane was viewed from above, its backdrop would likely be something like battlefields or forests. Thus a darker colour was required to camouflage the plane. When the plane was viewed from below, its backdrop would likely be the sky and a darker colour was unnecessary. In contrast, a plane that flew nighttime bombing runs would have been painted a darker colour on both the top and bottom so that it could blend in better during the night.
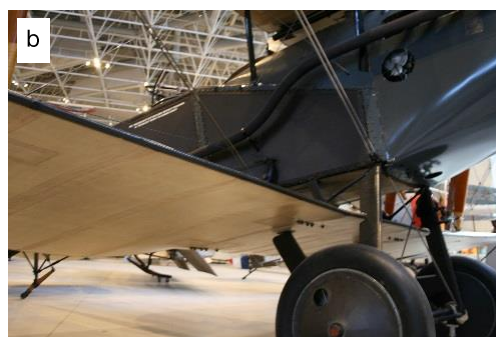

Image 1: Bristol F.2B fighter aircraft. (a) Side view, (b) Underside.

Canada Aviation and Space Museum, Artifact no. 2006.0022.

By contrast Germany and its allies tended to use a mixture of colours to camouflage their planes. While initially they used two or three colours applied in large blotches, in 1916 they started to use a pattern of polygons (such

as lozenges and hexagons) that were four to five different colours. Similar to the Allies, the exact colours would depend on when the mission occurred, with lighter colours used for the day and darker colours used for the night. In Image 2, you can see an example of the polygon pattern on the A.E.G. G.IV found at the Canada Aviation and Space Museum; this plane was used during night bombing runs.

Image 2: Side view of an A.E.G. G.IV bomber. Note the polygon pattern used for camouflage purposes.

Canada Aviation and Space Museum, Artifact no. 1967.0632.

Markings were another important aspect of a plane's appearance during the First World War. In the War's early days, planes had no consistent markings. As a result armies ended up accidentally shooting down their own planes! To rectify this situation, an identification system was developed.

Most of the Allied countries adopted the roundel or cockade, which had originated in France during the French Revolution. On French planes, the cockade was blue in the centre, surrounded by white, and then red; an example of this can be found on the wings of the Nieuport 12 (Image 3).

Image 3: Front view of the Nieuport 12.

Canada Aviation and Space Museum, Artifact no. 1967.0685.
Photo: Image Bank CAVM 33928

Other Allied countries altered the colours of the cockade. For instance, the cockade for the United Kingdom was red in the centre, surrounded by white, and then blue. This can be seen in the Bristol F.2B (Image 1a). While each country would place its cockade in different locations, some common placements included on the fuselage, on the top of the upper wings and the bottom on the lower wings. In addition the tail or rudder would often have some sort of stripping in the colour of the cockade (Image 1a).

Finally, planes would usually have a serial number, a squadron identifier, and an individual plane identifier. The serial number was put there by the manufacturer, and consisted of a long list of numbers and letters (see the tail of the Bristol F.2B in Image 1a). A squadron identifier would usually be some sort of simple marking (such as a triangle or zig-zag), and an individual plane identifier would usually be a letter or number. In Image 4, below, you can see the squadron identifier—a vertical line and a backslash (which is partly obscured)—and the individual identifier, a "B", of a Sopwith 7F.1 Snipe, which was also flown during the First World War.

Image 4: Side view of the Sopwith 7F.1 Snipe fighter. Note both the squadron identifier (a white vertical line and a backslash) and the individual identifier (a white "B").

Canada Aviation and Space Museum, Artifact no. 1967.0690.

For the Germans and their allies, the main symbol that they used was the Iron Cross, although on April 15, 1918, it was changed to the Greek cross, or Balkenkreuz. In Image 5, you can see a Balkenkreuz on an A.E.G. G.IV.

Image 5: Side view of an A.E.G. G.IV bomber.

Canada Aviation and Space Museum, Artifact no. 1967.0632.

The markings and camouflage described above were general guidelines used during the War, and there were exceptions on both sides. One of the best examples was the famous German pilot, Manfred von Richthofen (the Red Baron), and the squadron he led: Jagdgeschwader 1 or "Flying Circus". The Red Baron's plane was bright red, and the rest of the planes in the Flying Circus were also painted in a way that seemed designed to draw attention, rather than avoid it. The pilots of the Flying Circus also tended to rove around the front lines, appearing wherever they were needed most.

EXPLANATION

FLIGHT AND THE FIRST WORLD WAR

Humans have long been fascinated by flight. There are many instances of humans attaching wings and feathers to their arms in an attempt to mimic birds; not surprisingly many of these attempts did not end well. Roger Bacon is thought to be the first to explore human flight from a scientific perspective in 1250.

Since then, many other great thinkers have focused on the principles of flight including Sir George Cayley, Otto Lilienthal and Samuel Langley. But it was not until 1903 that the first heavier-than-air flying machine (or airplane) took flight. On December 17, 1903, following a failed attempt three days earlier, Orville Wright became the first person to pilot a plane when he flew the one designed by himself and his brother Wilbur in North Carolina. The machine was flown four times for distances of 36.6 m, 53.3 m, 61 m and 260 m. While the plane was never flown again, the Wright Brothers' achievement marked the beginning of modern aeronautic technologies, which transformed many sectors of society.

One of these transformed sectors was the military. The First World War was the first major conflict in which airplanes were used on a large scale. Initially, planes were met with skepticism, and they were used primarily in observation missions. Officials soon realized that they were capable of much more. For instance, to prevent other aircraft from completing their missions, fighter planes could be used to shoot them down. The First World War also saw the beginning of targeted airplane bombing runs. While bombardment missions had been used in the past, this was the first time they were used strategically, targeting such things as logistical and manufacturing centres.

As a result of these advances the First World War involved the use of a variety of different aircraft, including the ones in this activity. At Vimy Ridge, planes were primarily used for surveillance, the B.E. 2c being one of the main airplanes flown on the Allied side. In the broader Battle of Arras (which the Battle of Vimy Ridge), the battle for air superiority was more intense, with the Allied side using planes such as Sopwith Pups and Nieuport 17s, and the German side using primarily the Albatross DIII. In addition, several famous pilots participated in the Battle of Arras including Canada's Billy Bishop and Germany's Manfred von Richthofen, the "Red Baron".

Ingenium – Canada's Museums of Science and Innovation has more than 110 000 artifacts in its collection, including many different First World War planes. You can explore other objects in the collection at: ingeniumcanada.org/ingenium/collection-research/collection.php.