

Tanked! Energy Transformations of Mephisto

YEAR 8
PHYSICAL SCIENCES



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This partnership aims to engage and inspire people with the wonder of science, and increase the participation and performance of students in STEM-related subjects and careers — creating a highly capable workforce for the future.

Cover image: Mephisto, captured by 26th Battalion at Monument Wood near Villers Bretonneux, France at an operation on the 14th July 1918. Fred Port Collection. © QM, Peter Waddington.

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EXPLORE – EXPLAIN – ELABORATE

Tanked! Energy Transformations of Mephisto

Teacher Resource

In this activity students investigate the energy transformations found in the First World War tank, Mephisto. This activity requires students to have an understanding of energy types and energy transformations and may be used to assess and extend student knowledge.

Mephisto was one of 20 A7V Sturmpanzerwagen tanks produced by the German Army in late 1917 and is the last surviving tank of its kind in the world.

To deliver important tactical messages to Mephisto, a messenger was required to run up to the tank and tap messages on the door with a hammer. This was an extremely dangerous job due to its proximity to the centre of the battlefield and exposure to enemy fire. This is an important energy transformation that is not seen in the image on the following pages; however, it could be shared with students as an example response to the activity. Today you can still see marks left by these messengers on the door of Mephisto, which is on display at Queensland Museum, South Bank.

Curriculum Links

Science

YEAR 8

Science Understanding

Energy appears in different forms, including movement (kinetic energy), heat and potential energy, and energy transformations and transfers cause change within systems (ACSSU155)

Science Inquiry Skills

Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS148)

General Capabilities

Literacy

Comprehending texts through listening, reading and viewing
Composing texts through speaking, writing and creating
Visual knowledge

Critical and Creative Thinking

Inquiring: Identifying, exploring and organising information and ideas

Tanked! Energy Transformations of Mephisto

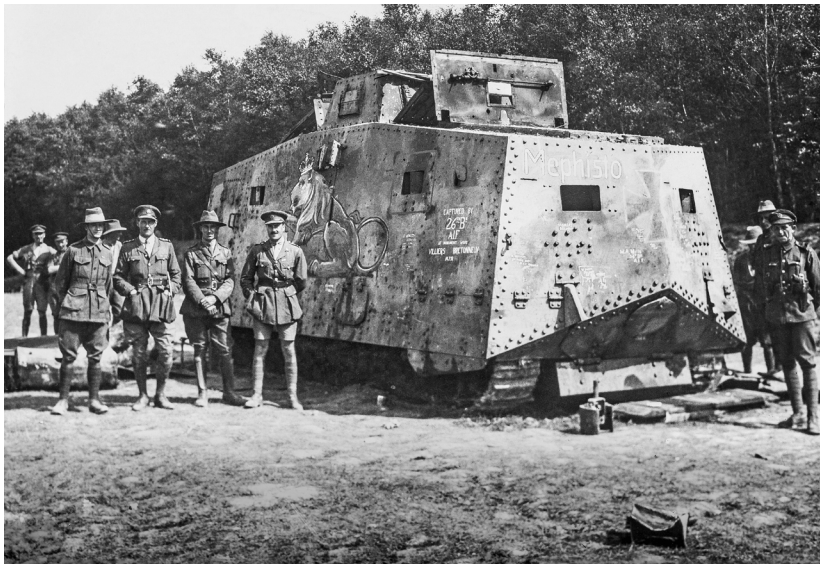
Student Activity

Tank Warfare

The First World War represents one of the bloodiest conflicts in the history of humankind. The war witnessed the mechanisation of armed forces across the world. All sides raced to develop new weaponry that would bring some advantage over their opponents, especially in the landlocked stalemates in the trenches of the Western Front. In 1916 the British Army deployed the first tanks at the Battle of the Somme. The allied forces continued to use tanks in larger numbers in 1917. The potential of this new weapon was realised perhaps too late by the German Army.

In late 1917 the German Army produced 20 A7V Sturmpanzerwagens which were deployed in combat the following year. The German tanks fought in locations such as Villers-Bretonneux, a small French village that was recaptured by Australian soldiers at the cost of 1,200 lives. The A7Vs were also involved in the first tank versus tank action.

A7Vs, including Mephisto (pictured below), were crewed by 18 men who worked in uncomfortably hot, cramped and loud conditions amongst the tank's fuel-powered engine and internal artillery. Despite its strong armour and large size, the men inside were thrown around mercilessly during battle as the tank moved over uneven ground and was hit by artillery. Each hit sent particles of hot metal flying off the walls inside the tank into the crew. The crew also had very poor vision from the tank, looking through tiny slits on the front and side of the tank.



A7V Specifications

- Weight: 33.4 tonnes
- Length: 8 m
- Width: 3.2 m
- Height: 3.3 m
- Range: 40 km
- Speed: 16 km/h (with 'tail wind')
- Armour: 10-30 mm
- Crew: 18

Queensland Museum, Fred Port Collection

Mephisto – the German A7V recovered by the 26th Battalion. Mephisto was named after the smiling red demon painted on the front of the tank. After capture, the allied soldiers marked the tank with a crown-wearing British lion, its right paw resting on an A7V tank, as shown in the image above.

Mephisto

The A7V Sturmpanzerwagen known as Mephisto was immobilised in an area close to Villers-Bretonneux called Monument Wood. In July 1918 a detachment of soldiers from the 26th Battalion, mainly comprised of Queenslanders, helped recover the abandoned tank and drag it back to the allied lines. It was sent to Australia as a war trophy, arriving at Norman Wharf in June 1919 where it was towed by two Brisbane City Council steamrollers to Queensland Museum, then located in Fortitude Valley. One of Australia's most significant war trophies, Mephisto is now in its permanent home within the *Anzac Legacy Gallery* at Queensland Museum, South Bank. It remains the sole surviving A7V tank in the world.



© Queensland Museum, Peter Waddington

Mephisto in its permanent home in the Anzac Legacy Gallery at Queensland Museum, South Bank.

Energy to Work

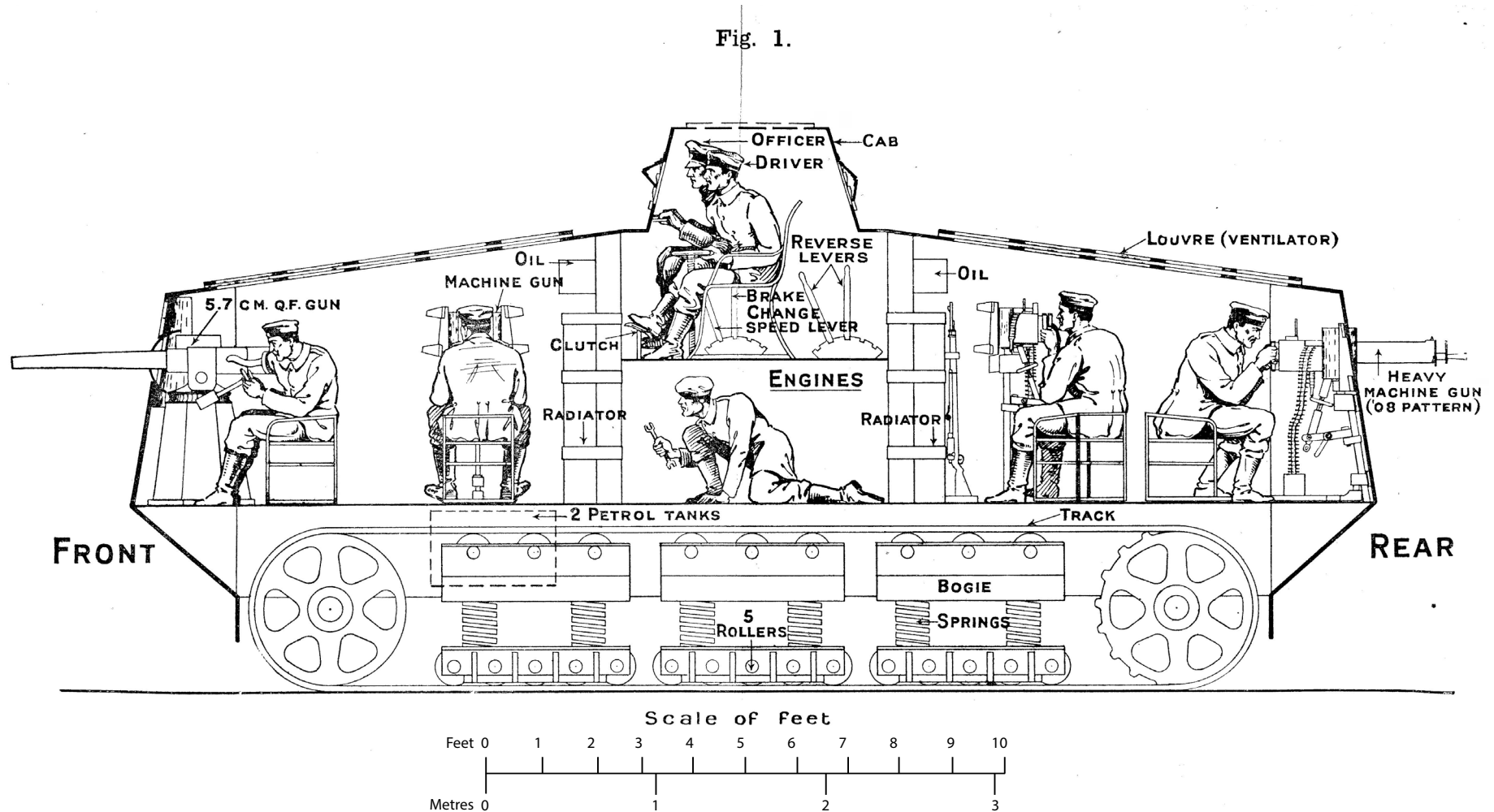
Tanks were one of the major technological innovations of the First World War. Tanks, like all machines, rely on energy to do work; the transformation and transfer of energy allows the tank to move and cause damage. It is your task to identify the energy and energy transformations in the diagram below.



© Queensland Museum, Gary Cranitch

Damage in the armour of Mephisto. What may have caused this damage?

1. How many types of energy can you identify in the diagram below? Label these on the diagram of Mephisto.
2. Draw a flow diagram to represent each energy transformation that would occur as Mephisto travelled through the battlefield.



VIEW OF INTERIOR OF TANK.

Courtesy of The Gregory Czechura Collection

3. What waste energy is produced by Mephisto? Explain the advantages of a more energy efficient tank.

4. Focussing on energy transformation and transfer, how could you stop the tank from advancing and causing damage?

5. What energy transformations occur when projectiles hit the tank?

6. The tank is equipped with heavy artillery, however most soldiers were equipped with rifles or grenades. Use your knowledge of physics to explain why soldiers could not carry heavy artillery.

7. Imagine you are a member of the Mephisto crew. Write a persuasive letter home to either:
- a) Convince your brother or sister that they should NOT join the war effort.
 - b) Convince your parents that you are fine and enjoying your time fighting for freedom on the front lines.