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| **Wearable cockpit** |
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| Using modern technologies to enhance flight |
| **Subject(s):** Design and Technology, Engineering**Approx time:** 70-100 minutes |  | **Key words / Topics:** * artificial intelligence
* augmented reality
* cockpit
* design ideas
* evaluation
* future of flight
* specification
* virtual reality
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| **Stay safe** Whether you are a scientist researching a new medicine or an engineer solving climate change, safety always comes first. An adult must always be around and supervising when doing this activity. You are responsible for:• ensuring that any equipment used for this activity is in good working condition• behaving sensibly and following any safety instructions so as not to hurt or injure yourself or others Please note that in the absence of any negligence or other breach of duty by us, this activity is carried out at your own risk. It is important to take extra care at the stages marked with this symbol: ⚠ |
| **Suggested Learning Outcomes**  |  |  |
| * To be able to design a wearable cockpit for an aircraft fighter pilot
* To understand the potential applications of artificial intelligence, augmented reality and virtual reality in the aviation industry
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| **Introduction** |  |  |
| This is one of a series of resources designed to allow learners to use the theme of the future of flight to develop their knowledge and skills in Design & Technology and Engineering. This resource focusses on making use of modern technologies to design a wearable cockpit for an aircraft pilot.Modern technologies, such as artificial intelligence (AI), augmented reality (AR) and virtual reality (VR), have the potential to completely change how pilots interact with and control their aircraft. Can you design a wearable cockpit that make use of these?  |
| **Purpose of this activity**In this activity learners will make use of the theme of the future of flight to design a wearable cockpit that makes use of new and modern technologies. They will produce a specification for their design requirements and a mind map of ideas. They will then produce sketches of their initial ideas before producing a completed final design.This activity could be used as a main lesson activity to teach about sketching and design skills within an aviation theme. It could also be used as part of a wider scheme of learning to support the teaching of the design process within Design & Technology and Engineering, or about engineering career opportunities within the aviation sector. |
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| **Activity** |  | **Teacher notes** |
| **Introduction (10 minutes)**Teacher to introduce the activity and explain the design process that will be used to solve the problem. Teacher to introduce and discuss the context and design brief shown in the presentation.**Producing a specification for the cockpit controls (10-15 minutes)**Teacher to explain what is meant by a specification and why this is an important part of the design process. Learners to produce a specification for the controls needed for the wearable cockpit.**Mind Mapping (10 minutes)**Learners to further explore the context and design considerations by completing the scaffolded mind map provided on the activity worksheet.**Design idea – virtual display (15-25 minutes)**Learners to create a design for the layout of the virtual display (AR/VR interface). **Design idea – helmet (15-25 minutes)**Learners to use the results of the specification and mind mapping activity to produce initial sketches of their design idea for a wearable cockpit helmet. They should consider what controls would be needed.**Evaluation (10-15 minutes)**Learners to reflect upon the process undertaken, answering questions from the activity sheet. What is good about their design? What could be improved? |  | **Specification** Points for discussion during the activity could include:How would the pilot interact with the controls?Could the pilot’s gaze cause a display to enlarge when looked at? Could controls be changed by gestures/ speech/ thoughts?**Mind mapping**The mind map could be scaffolded further to suit needs of learners.**Designing**Learners could use the template on the activity sheet to sketch initial ideas for the wearable cockpit helmet.**Evaluation**Explain that the success of a design is usually measured against the original specification, so it is important to evaluate against this. This is a good opportunity to include peer/self assessment, as learners could evaluate each other’s designs.The activity sheet gives a set of questions and a table that can be filled in to assist with this task. Questions on the activity sheet could be made simpler or more challenging depending on the ability of learners. Sentence starters could be used for the evaluation that would guide the learners in their writing.  |
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| **Differentiation** |  |  |
| **Basic** |  | **Extension** |
| * Provide learners with increased scaffolding mind map to aid design development.
* Allow learners to model the helmet in card if struggling to design using sketches.
* Provide sentence starters for the evaluation.
* Provide an exemplar layout for the display.
 |  | * Make a 3D model of the final design. E.g. using block modelling or rapid prototyping.
* Design an advanced user interface for the controls.
* List additional potential applications of AR and VR technologies in aviation.
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| **Resources** |  | **Required files** icon-docicon-pdficon-ppt |
| * Pencils
* Pen
* Paper
* Cardboard
* Tape
* Scissors
 |  |  Presentation – Wearable cockpiticon-doc Wearable cockpit activity sheet |
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| **Additional websites** |
| * **BAE Systems – Wearable cockpit:** Explanation of the work that BAE are doing in this area and is useful for context for the activity. [https://www.imeche.org/news/news-article/the-'wearable-cockpit'-could-change-fighter-jet-controls-forever](https://www.imeche.org/news/news-article/the-%27wearable-cockpit%27-could-change-fighter-jet-controls-forever)
* **Wearable cockpits – the ultimate human interface:** <https://www.aerosociety.com/news/wearable-cockpits-the-ultimate-human-machine-interface/>
* **BAE systems fighter pilots:** <https://newatlas.com/bae-systems-wearable-cockpit/56453/>
* **Design process:** Explanation of the steps in the design process. <https://discoverdesign.org/handbook>
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| **Related activities (to build a full lesson)** |  |  |
| **Starters** (Options) * Show a picture of an old fighter plane cockpit, one from around 2018 and a futuristic one. Discuss the differences and the reasons behind this change.
 | **Plenary*** Learners to share their thoughts on what the future of air travel and aviation is – where will technology take us next?
* Self/peer assess the design ideas produced.
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| **The Engineering Context** film |
| * The future of flight is a great context to explore the opportunities that working in the aeronautical engineering industry presents! For example, designing, making and maintaining aircraft and all their different parts.
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| **Curriculum links** |
| **England: National Curriculum**Design & Technology * KS3 develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations
* KS3 understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists.

**Scotland: Curriculum for Excellence**Technologies* I can apply my knowledge and understanding of engineering disciplines and can develop/build solutions to given tasks
* TCH 3-12a
 | **Northern Ireland Curriculum**Technology & Design* KS3 identifying problems; investigating, generating, developing, modelling and evaluating design proposals; giving consideration to form, function and safety.

**Wales: National Curriculum** Design and Technology* KS3 identify and use appropriate sources of information to help generate and develop their ideas for products
* KS3 be creative and innovative in their thinking when generating ideas for their products.
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| **Assessment opportunities** |
| * Informal teacher assessment of completed worksheets and designs.
* Self/peer assessment of designs produced.
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