

**AIRBUS**

**Student Booklet**

**Could you be our engineer….?**

**With thanks to our supporters and sponsors…**

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# Context

One very important aspect of the work of Airbus is the support of international aid organisations. Their products and resources, from relief flights to satellite imagery and helicopters, are used to support the work of emergency responders around the world.

A picture containing plane, outdoor, ground, truck

Description automatically generated

One way they do this is through the Airbus Foundation which has brought together a global network of airlines and relief organisations to support humanitarian causes. Since 2008, the Foundation has organised the delivery of 650 tons of aid materials around the world, delivering medical and school supplies, food, water sanitation equipment, toys, clothing and emergency response units to the most vulnerable.

Now they want your help in continuing to develop new and exciting ideas which can help them either:



* help transport or deliver the aid or,
* provide something which could be taken out to people in times of need.

**Remember, engineering is about people.** **Today is your chance to make a difference, could you be our engineer...?**

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# 2. The Brief

The Airbus team wants you to:

* **Design and engineer ONE** prototype which will either help transport aid or help people in times of need. Your prototype must include **at least** one electronic circuit/component.
* **Complete** the planning and events log to show how you have designed your idea, and solved problems and worked as a team throughout the project.
* **Present** your prototype to the IET Faraday Airbus judge(s).

You will need to demonstrate the skills and attitudes we are looking for so:

* be creative;
* plan carefully;
* work within the resources and the budget available;
* be realistic about what is achievable in the time available;
* be resilient and persevere with problems;
* record your thinking;
* keep to strict deadlines.

**Considerations:**

* Weight – heavy things are more difficult to transport both through air and on land.
* Energy – access to power sources can be difficult.
* Flexibility – we need to be able to change things back quickly.
* Sustainability - what will happen to the things taken out to help in times of disaster once they are no longer needed? Could they be converted for alternative use or recycled?

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# Schedule for the day

|  |  |
| --- | --- |
| **09:15** | Register your team |
| **09:30** | Welcome and introduction |
| **09:50** | **Project brief:** Introduction to the Faraday Challenge |
| **10:10** | **Planning:** Identifying the problems and generating initial ideas |
| **10:25** | **Team role selection:** team decides on which roles they need |
| **10:30** | **Engineering apprenticeship:** teams complete a short engineering task |
| **10:40** | **Development**   * Shop opens * Agree on final product designs |
| **11:00** | **Break** |
| **11:10** | **Development continues**   * Continue to design and modify where necessary * Record progress in event log |
| **12.20** | Teams are briefed on the content of the presentation and the engineering priorities. |
| **12:30** | **Lunch** – Tools down |
| **13:00** | **Development: Final preparations**   * Finalise product * Prepare presentation with notes |
| **13:30** | * Shop closes * Submit accounting sheet to the shop keeper * Practise presentation |
| **13:50** | **Presentation**   * Teams present their designs to the judge(s) |
| **14:45** | Award ceremony with final feedback and evaluation of the day |
| **15:00** | Engineering teams depart |

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**4. Engineering apprenticeship**

In this circuit you are going to make a light dimmer or brighter depending on the level of resistance in a circuit.

Connect the circuit as shown below.

Crocodile lead

Crocodile lead

Battery pack

Crocodile lead

Light Dependent Resistor (LDR)

Piezo buzzer

**Top tips:**

* The LDR must be connected to the positive terminal of the battery (red wire).
* The red wire of the piezo buzzer must be connected next in the circuit on the positive terminal side of the battery pack.

Your LED may light up if you are working in a light room but, if not, try shining a torch on to the LDR. Ask your challenge leader if you do not have one.

Hold your hand over the Light Dependent Resistor (LDR) and listen to what happens to the buzzer.

**Questions:**

* What happens when you vary the light level on the Light Dependent Resistor?
* How could you vary or manage the resistance in your circuit(s)?

**5. Shop resource sheet**

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**Items to buy**

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Electrical components** | | | | |
| **Item** | **Description** | | **Unit** | **Cost** |
| Crocodile leads |  | Lead with crocodile clips at each end | Each | 4 Faradays |
| Terminal blocks |  | Can be used to connect insulated wire | Block of 4 | 1 Faraday |
| Piezo buzzer | Kittronic buzzer | Connect in a circuit to give a sound output | Each | 6 Faradays |
| LED – various colours |  | Light Emitting Diode which lights up when connected in a circuit. Choose from red, orange, green or blue. | Each | 6 Faradays |
| Motor |  | Connect in a circuit to create clockwise or anti-clockwise movement. Will **not work** with a solar panel or an LDR. | Each | 6 Faradays |
| Solar motor | A close up of a device  Description generated with high confidence | Connect to a solar panel to create clockwise or anti-clockwise movement. | Each | 6 Faradays |
| Servo motor  (0 to 90 degrees) | A picture containing wall, indoor, table  Description generated with very high confidence | Use with a servo motor control unit to control movement from 0o to 90o | Each | 6 Faradays |
| Servo motor (continuous) | A picture containing wall, indoor, table  Description generated with very high confidence | Use with a servo motor control unit to control continuous movement through 360o | Each | 6 Faradays |
| Light Dependent Resistor (LDR) | LDR 2 | Component that detects the light level and changes resistance in a circuit. | Each | 8 Faradays |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Push to make switch |  | Connects a circuit when pushed down and breaks the circuit when released. | Each | 6 Faradays |
| Moisture sensor |  | Component which detects moisture in the surroundings. Can also be used to detect materials which conduct electricity. | Each | 8 Faradays |
| Servo motor control unit |  | Use this to control a servo motor. **You MUST** read the ‘How to …’ sheet before connecting this component. | Each | 8 Faradays |
| Motor holder |  | Used to fix a motor or a syringe in position. NOTE: you will need the insert to connect a syringe. | Each | 4 Faradays |
| Gear attachment for motor |  | Used to connect a motor to a cog. | Each | 2 Faradays |
| Pulley attachment for motor |  | Used to connect a motor to a pulley wheel – will need connector (e.g. elastic band) | Each | 2 Faradays |
| Solar panel |  | Used to power components using the power of the sun. **You MUST** read the ‘How to …’ sheet before using. | Each | 6 Faradays |
| 2AA cells in battery holder with battery snap |  | Used to provide power for your circuit | Each | 4 Faradays |
| 4 AA cells in battery holder with jumper leads | A picture containing wall, indoor  Description generated with very high confidence | **ONLY** **to be used** with servo motor control unit. | Each | 6 Faradays |

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Construction materials** | | | | |
| **Item** | **Description** | **Unit** | | **Cost** |
| Correx | Used to create structures | Piece | | 6 Faradays |
| Plastic syringes with tube | Used to develop pneumatic system | Pair of syringes with plastic tube | 6 Faradays | |
| Small cog | Used in gear systems with motors | Each | 2 Faradays | |
| Medium cog | Used in gear systems with motors | Each | 2 Faradays | |
| Large cog | Used in gear systems with motors | Each | 4 Faradays | |
| Dowel | Piece of solid cylindrical wooden rod used to create structures | Each | 4 Faradays | |
| Pulley wheel 54cm | Used to connect to pulley attachments on motor | Each | 6 Faradays | |
| Wooden wheel 54cm | Used with motors to drive something | Each | 4 Faradays | |
| Plastic reel | Used in construction | Each | 4 Faradays | |
| Polyfoam | A5 sheet – assorted colours | Each | 4 Faradays | |
| Coloured card | A4 sheet of card – assorted colours | Each | 4 Faradays | |
| Aluminium foil | A conductive material which can be used to make pressure pads or switches (**MUST NOT** be used in place of connecting wires) | 10cm strip | 6 Faradays | |
| Masking tape | Can be used to secure light parts in your design. **NOTE:** excessive use of tape will result in an additional charge | Roll | 6 Faradays | |
| Sponge | Can be used to make pressure switches or enhance your design. | Each | 6 Faradays | |
| Paperclip | Used to create switches or in construction | Each | 1 Faraday | |
| Paper fastener | Used to create switches or in construction | Each | 1 Faraday | |
| Elastic bands | Used to hold or create working parts, including driving pulley wheels | Each | 1 Faraday | |

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|  |  |  |  |
| --- | --- | --- | --- |
| Cable ties | Can be used to hold your structures in place | Each | 2 Faradays |
| String | Can be used as part of your product design | 30cm piece | 4 Faradays |
| Baking parchment | Can be used as part of your product design | 10cm strip | 6 Faradays |
| Wooden lolly sticks | Can be used as part of your product design | Each | 4 Faradays |
| Hire Centre Trade Card | Use this to hire various items from the hire section of the shop – see below for details | One per team | 6 Faradays |

**Available with your Hire Centre Trade Card**

These items can be hired from the shop if you buy a Hire Centre Trade Card. You will need to take it to the shop and show the shopkeeper each time you want to use of one of these items. You may only get one item at a time.

|  |  |
| --- | --- |
| Stapler | Used to staple soft materials only |
| Hole punch | Used to make small holes in soft materials |
| Ruler | Used to measure any part of your product or additional items |
| Scissors | Used for soft materials only |
| Screwdriver | Used to connect insulated wire in terminal blocks or to bulb holders. |
| Wire strippers | Used to cut or strip insulated wire. |

**Free to use**

The cutting station may be used at any point **BUT** only 3 people will be allowed at this station at any one time. Please take care when using this equipment.

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# 6. Assessment information and criteria

|  |  |
| --- | --- |
| Criteria | Marks |
| 1. Planning | 13 marks |
| 1. Development of product | 20 marks |
| 1. Use of budget | 8 marks |
| 1. The product | 30 marks |
| 1. The presentation | 15 marks |
| 1. Teamwork | 14 marks |
| **Total** | **100 marks** |

1. **Planning (13 marks)**

Using the planning section of the Planning and Event Log, marks will be awarded as follows:

* Did they explain how their ideas might help Airbus in their mission to support people in need? ***(3 marks)***
* Does the planning diagram detail how the prototype will be constructed? (***5 marks)***
* Have the electronics for the prototype been detailed? ***(5 marks)***

1. **Development of product (20 marks)**

Using the Engineering Event Log and observations of the team, marks will be awarded as follows:

* Event log 1 - Have they provided an accurate and informative record of development beyond a simple description including any problems and solutions? ***(4 marks)***
* Event log 2 - Have they provided an accurate and informative record of development beyond a simple description including any problems and solutions? ***(4 marks)***
* Event log 3 - Have they provided an accurate and informative record of development beyond a simple description including any problems and solutions? ***(4 marks)***
* Are the priorities identified for the last 30 minutes realistic and appropriate?

***(4 marks)***

* Did the team work largely independently? ***(4 marks)***

1. **Use of budget (8 marks)**

Using the accountancy sheet and the prototype, marks will be awarded as follows:

* Was there an accurate record of spending? ***(3 marks)***
* Was the budget used effectively? ***(5 marks)***

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**4. The product (30 marks)**

Using the presentation of your prototype and what we have seen during the development period, marks will be awarded for:

* Did their prototype provide a realistic solution to the brief from Airbus? ***(4 marks)***
* Was the choice of electronic components appropriate for their intended design?

***(4 marks)***

* Was the choice of materials appropriate for the structure and/or mechanics of their intended design? ***(4 marks)***
* Was the final prototype engineered well with all elements coming together in a well-structured and fit for intended purpose product? ***(6 marks)***
* Did the judge(s) see the electronics and structure work together effectively as intended? ***(6 marks)***
* Did the team push themselves beyond the minimum brief and incorporate at least 2 or more processes? ***(6 marks)***

**5. The presentation (15 marks)**

Using the presentation of your prototype, marks will be awarded as follows:

* Did the team explain how their prototype works, including details of how and why they used the electronics and the mechanics in their design? ***(6 marks)***
* Did the team identify the most challenging engineering aspect they faced during their development and how they overcame this challenge? ***(3 marks)***
* Did the team explain what they did well in their teamwork and what aspects they could have improved? ***(4 marks)***
* Did the team effectively demonstrate their prototype? ***(2 marks)***

1. **Teamwork (14 marks)**

Using the judges’ observations of your team throughout the day, marks will be awarded as follows:

* Did the team work well together with all members engaged in the project and any conflicts successfully resolved? ***(5 marks)***
* Did the team work tidily and safely within the health and safety rules? ***(3 marks)***
* Did the team persevere to resolve issues during the project and work largely independently? ***(6 marks)***

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