ROYAL AIR FORCE

STEM AMBASSADORS

EARTHQUAKE CHALLENGE (DISASTER RESPONSE)

PREP PACK FOR VOLUNTEERS

Suitability:
This activity would suit being delivered by volunteers who have considerable experience of supporting STEM sessions in schools.

VERY EXPERIENCED

★★★

Objective

The object of this activity is to **introduce engineering and logistics principles of value to a 'rescue' challenge.**

Information to share with teachers

This session reinforces aspects of the KS2 and KS3 Mathematics National Curriculum around:

- Scientific method
- Measurement
- Calculation
- Evaluation

National Curriculum: science KS2
National Curriculum: science KS3

Promoting links between the school and the RAF (things to say)

- How the activity can help dispel myths about the RAF and illustrate available opportunities.
- Broaden horizons about careers and options.
- Help to enthuse and engage students.
- Raise teacher awareness of what the RAF do.
- How this activity can help the school develop closer links with RAF volunteers.

Activities in schools

Preparing to run the activity in a school

Typically teachers work to a lesson plan. Lesson plans detail the basic structure of the session, timings for each section and contingency plans for more and less able pupils. An example lesson plan is included in this pack.

Preparing yourself and agreeing timings, level of involvement for the school, for you and your colleagues

Make sure you get to the school in good time, allowing plenty of time for preparation and setting the room and your materials out. Check with your school link on what materials are provided and what you need to bring. If you require worksheets or photocopying, agree this with your school link well in advance of the session. Allow plenty of time to clear up at the end and make sure you have thought about a contingency plan if anything goes wrong. Identify the year group and level to pitch the activity at.

Most STEM Ambassador activity would typically be with years 5 – 9 (ages 9 – 13) and would cover aspects of the National Curriculum for Key stages 2 and 3.

The school science curriculum, part of the National Curriculum is detailed and schools would not expect you to know about this. However, you might like to take a look at some of its content to familiarise yourself with the areas covered.

National curriculum in England: science programmes of study

Schools run dedicated 'Career Day' events. You may be asked to incorporate a STEM session into these events. Take along career-linked resources where possible to hand out after the activity.

Planning this activity

The object of this activity is to introduce engineering and logistics principles of value to a 'rescue' challenge.

This activity requires some planning in terms of securing the materials for the session and ensuring it runs to time. It is designed for STEM Ambassadors with considerable experience of running activities in schools.

RESOURCES REQUIRED

- Flat teaching space with pupils working in small groups of around 3-4.
- Laminated map of Ascension Island.
- Laminates of aircraft/notes.
- Paper
- Pencils.
- Rubbers.
- Calculator.
- Prizes (optional).

- Powerpoint presentation 'Earthquake' that accompanies this Prep Pack.

Assessing risks associated with the activity

The organiser (typically the school or other host organisation) of the activity is responsible for the health and safety of the young people on their site or property. However, because you as the STEM Ambassador also have a duty of care you may be asked by the teacher or organiser to contribute to their risk assessment. Discuss the activity with the organiser (school) and ask them to provide a copy of their risk assessment.

Risk assessment examples

Your school contact should be aware of other risk assessments used for activities in school, which could be adapted for this activity. If they are unsure of the risks involved in running practical STEM activities in school you could direct them to relevant resources produced by experts in the field. STEM Learning have lots of resources/templates and guidance on this. The link below provides details of actions they can take to manage risk in their school, along with some templates for STEM-related activities.

A balanced approach to risk

As this STEM Ambassador Prep Pack details your activity and all the resources required, the school may find the pack useful in helping them to construct an appropriate risk assessment.

ID on the day

Visitors to schools may be asked for their current DBS Certificate or the corresponding Certificate Number. Schools may also ask for some form of current photo identification if a DBS Certificate is not produced. Schools will typically issue a visitor ID at reception for each separate visit to the school. Visitor ID if issued, must be worn at all times whilst on site. You should always expect to be working alongside a member of school staff where children are involved. It is not good practice for a visitor to be left alone with a group or individual children. STEM Ambassadors are reminded that the use of student personal data, photographs, videos or other information about students is not permitted and must not be put on social media.

Differentiation for more able and less able pupils:

More able

Add additional problems occurring throughout the exercise (i.e. earthmoving equipment is needed to clear the runway).

Less able

Suggest starting points and options to consider.

Logistics

Schools are secure sites and access may be restricted. Ask your school contact before you visit about getting onto the site, where to park and where to report to. Schools may not provide lunch so it may be advisable to bring your own refreshments and snacks.

Parking at some schools can be difficult. Check with your schools contact about the availability of visitor parking.

Handouts for pupils

As laminates to share in groups.

- **Task factsheet**
- **Ascension location**
- **Equipment at your disposal**
- **Equipment assessment grid**

Additional resources

If you are interested in adapting or enhancing this activity we've identified some additional online resources to help you with this. Click the weblinks below to find out more.

- **British Geological Survey - list of latest earthquakes in the UK**
- **Disaster response (Royal Academy of Engineering)**
- **What causes earthquakes** YouTube

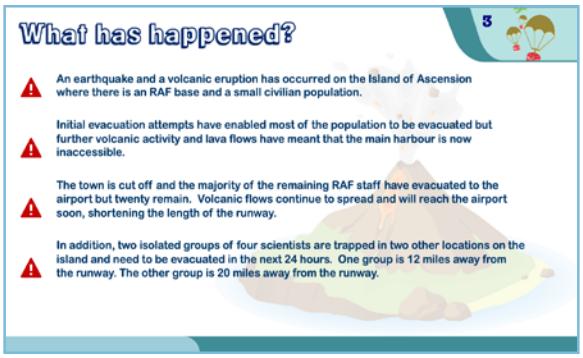
Running the activity: lesson plan

Session length: 50 minutes

10 minutes

Introduction to the session - today we are going to be issued with a challenge!

An earthquake and a volcanic eruption has occurred on the Island of Ascension where there is an RAF base and a small civilian population. Ask the group if they know where the island is? Over 4,500 miles away from the UK!



Initial evacuation attempts have enabled most of the population to be evacuated but further volcanic activity and lava flows have meant that the main harbour is now inaccessible.

The town is cut off and the majority of the remaining RAF staff have evacuated to the airport but twenty remain. Volcanic flows continue to spread and will reach the airport soon, shortening the length of the runway.

In addition, two isolated groups of four scientists are trapped in two other locations on the island and need to be evacuated in the next 24 hours. One group is 12 miles away from the runway. The other group is 20 miles away from the runway.

This information is provided on the student handouts. Ascension is an island 4,500 miles from the UK.
It will take 8 hours to reach the island from the UK.

The runway is 3,000 metres or 10,000 feet long. The runway is in danger of being partially covered by lava and it is estimated that less than half of it will be usable during the next 24 hours.

It is reported that some of the people on the island have injuries and will need medical attention and there may be some damage to communications equipment and structures at the airport.

30 minutes

Task is to work together (in small groups of

3-4) and plan a rescue of all remaining people from the island using equipment and resources available to you. You need to get as many people as possible off the island in as short a time as possible. You need to give reasoning for your choices. Each team is going to report back on their rescue mission plan.

Provide copies of '**Equipment assessment grid**' after initial discussion and group work has taken place - this will support groups to synthesise information and make judgments about what equipment to use.

It may be useful to share with pupils some of the 3D images of aircraft available on the RAF website:

3D RAF aircraft

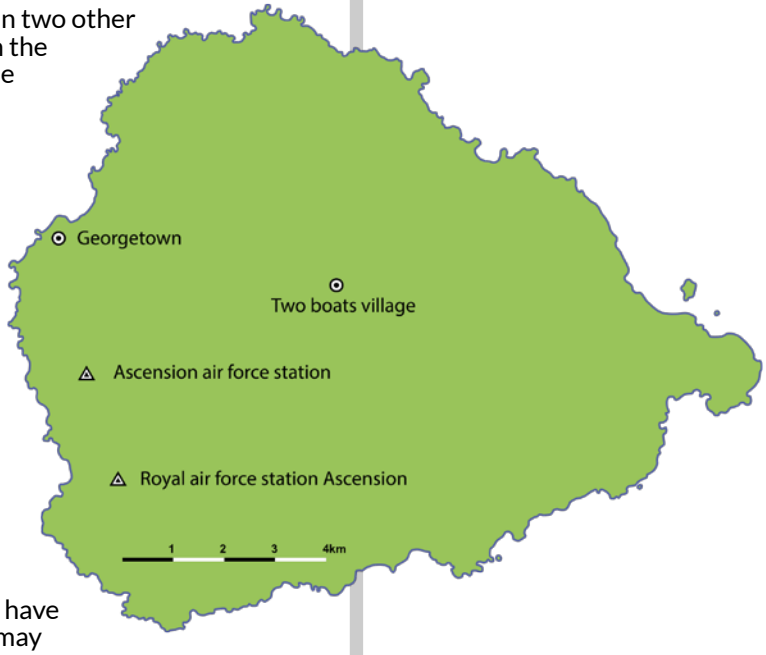
10 minutes

Plenary – presentation of solutions to the challenge.

EARTHQUAKE CHALLENGE (DISASTER RESPONSE)

Key information:

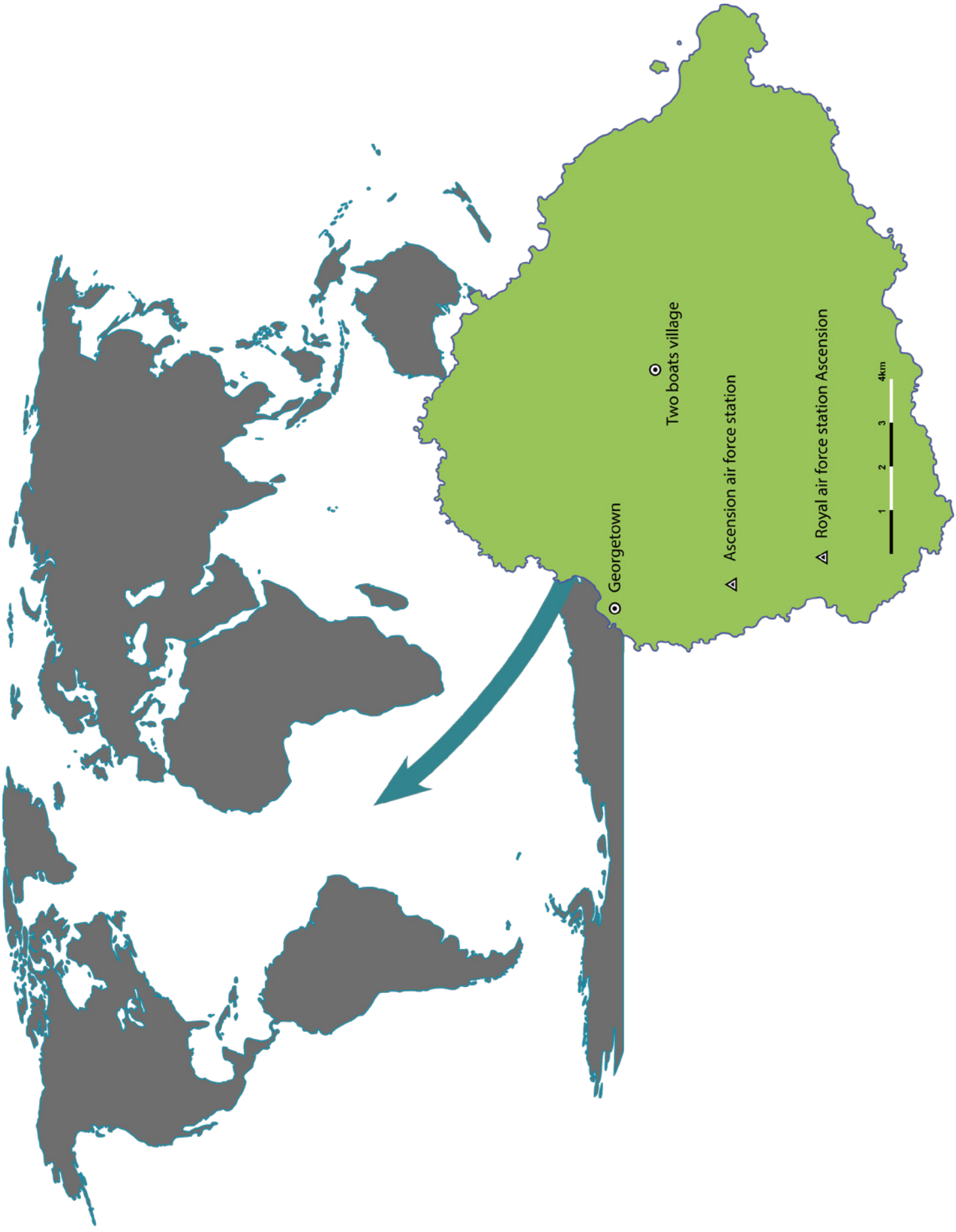
- Ascension is an island 4,500 miles from the UK.
- Two isolated groups of four scientists are trapped in two other locations on the island and need to be evacuated in the next 24 hours. One group is 12 miles away from the runway. The other group is 20 miles away from the runway.
- Volcanic flows continue to spread and will reach the airport soon, shortening the length of the runway.
- It will take 8 hours to reach the island from the UK.
- The runway is 3,000 metres or 10,000 feet long. The runway is in danger of being partially covered by lava and it is estimated that less than half of it will be useable during the next 24 hours.
- It is reported that some of the people on the island have injuries and will need medical attention and there may be some damage to communications equipment and structures at the airport.



Personnel at your disposal:

You have a selection of specialist staff from the RAF.

From this list, you need to decide who you will take with you to make your mission successful. You need to provide reasons for taking any specialist staff with you.


Two boats village
Ascension air force station
Royal air force station Ascension
Georgetown
1
2
3
4km

Handouts for pupils

Equipment at your disposal

Atlas A400M
(fixed-wing aircraft)

Payload (i.e. the weight it can carry) – 37,000 kgs (including helicopters, vehicles, supplies, personnel).
Ferry distance (i.e. how long it can travel for) 2,000 miles.
Landing - can land on short, unprepared airstrips.
Speed - cruise speed 400 miles/hour.

Scan this QR code to link to a 3D **working model** of this aircraft.

Hercules C130J
(fixed-wing aircraft)

Payload (i.e. the weight it can carry) – 20,000 kgs (including, vehicles, supplies, personnel).
Ferry distance (i.e. how long it can travel for) 2,850 miles.
Landing - can land on short, unprepared airstrips.
Speed - cruise speed 400 miles/hour.

Boeing C17 Globemaster
(fixed-wing aircraft)

Payload (i.e. the weight it can carry) – 45,000 kgs (including helicopters, vehicles, supplies, personnel).
Ferry distance (i.e. how long it can travel for) 4,500 miles
Landing – needs at least 1,100 metres or 3,500 feet of runway
Speed – cruise speed 500 miles/hour.

F35 Lightening II
(fixed-wing aircraft)

Payload (i.e. the weight it can carry) – 2,500 kgs (including bombs, rockets, 1 pilot).
Ferry distance (i.e. how long it can travel for) 900 miles
Landing – short take-off and vertical landing
Speed – cruise speed 1,200 miles/hour.

Scan this QR code to link to a 3D **working model** of this aircraft.

Handouts for pupils

Equipment at your disposal

Boeing CH47 Chinook rotary-wing helicopter)

Payload (i.e. the weight it can carry) – 10,000 kgs (including vehicles, supplies, 55 personnel).
Ferry distance (i.e. how long it can travel for) 400 miles
Landing – can land and take off vertically
Speed – cruise speed 160 miles/hour.

Scan this QR code to link to a 3D **working model** of this aircraft.

Leonardo AW109 (rotary-wing helicopter

Payload (i.e. the weight it can carry) – 1,000 kgs (including vehicles, supplies, 9 personnel).
Ferry distance (i.e. how long it can travel for) 450 miles
Landing – can land and take off vertically
Speed – cruise speed 150 miles/hour.

Westland Puma (rotary-wing helicopter)

Payload (i.e. the weight it can carry) – 2,000 kgs (including vehicles, supplies, 18 personnel).
Ferry distance (i.e. how long it can travel for) 500 miles
Landing – can land and take off vertically
Speed – cruise speed 170 miles/hour.

Additional information:
In-flight refueling is available for fixed-wing aircraft (i.e. not helicopters) on this mission.

Other equipment at your disposal:

+ Emergency food rations
+ Drinking water
+ Medical supplies
+ Fuel
+ Binoculars
+ Radio equipment
+ Quad bikes
+ Clothing
+ Makeshift shelters
+ Ropes and rescue equipment
+ Dogs
+ Explosives
+ Maps
+ Medical equipment
+ Flares

Aircraft	Payload (i.e. the weight it can carry)	Ferry Distance (i.e. how long it can travel for)	Landing	Cruise Speed	Your Notes
Atlas A400M (fixed-wing aircraft)	37,000 kgs (including helicopters, vehicles, supplies, personnel)	2,000 miles	Can land on short, unprepared airstrips	400 miles/hour	
Hercules C130J (fixed-wing aircraft)	20,000 kgs (including, vehicles, supplies, personnel)	2,850 miles	Can land on short, unprepared airstrips	400 miles/hour	
Boeing C17 Globemaster (fixed-wing aircraft)	45,000 kgs (including helicopters, vehicles, supplies, personnel)	4,500 miles	Needs at least 1,100 metres or 3,500 feet of runway	500 miles/hour	
Lightening II (fixed-wing aircraft)	2,500 kgs (including bombs, rockets, 1 pilot)	900 miles	Short take-off and vertical landing	1,200 miles/hour	
Boeing CH47 Chinook (rotary-wing helicopter)	10,000 kgs (including vehicles, supplies, 55 personnel)	400 miles	Can land and take off vertically	160 miles/hour	
Leonardo AW109 (rotary-wing helicopter)	1,000 kgs (including vehicles, supplies, 9 personnel)	450 miles	Can land and take off vertically	150 miles/hour	
Westland Puma (rotary-wing helicopter)	2,000 kgs (including vehicles, supplies, 18 personnel)	500 miles	Can land and take off vertically	170 miles/hour	

Please note: In-flight refuelling is available for fixed-wing aircraft (i.e. not helicopters) on this mission.