TAKE IT FURTHER

Activity 3: Really Fast Food to the Rescue

Time required: 60-80 minutes, spread over the course of 2 days

YOUR CHALLENGE

In emergency situations, such as a natural disaster, it's important to ensure that the food provided is not only delivered safely, but that it's also nutritious. Research and learn about cost-efficient special **nutrient** food products, then build and launch a craft that will carry a payload of energy bars to a specific target.

MATERIALS

Part One – Energy Bar Research:

- An assortment of energy bars (or their food labels)
- Paper
- Pencils
- Calculators

Part Two – Deliver the Goods:

- 1 FTD Construction Kit
- Energy bar
- Scale
- Packing tape
- Scissors
- 1 Rocket Launcher Kit
- 1 Launch Pad Set-Up
- Safety goggles for each participant

Unless you feel that you can construct a better design or your original design was damaged, you can use the same propulsion system and FTD — as well as the same construction kit —you used in the original experiment.

Food For Thought

What does food nutrition have to do with rocket science? In our situation, quite a lot!
The World Health Organization indicates that hunger and related malnutrition are the greatest single threats to the world's public health.

Real World, Real Solutions: High-Energy Biscuits

Food is a crucial part of the relief effort in disasters especially those involving children. Improving nutrition is widely regarded as the most effective form of aid that can be given to help malnourished populations. Nutrient-dense foods are critical to ending world malnourishment and they are critical in assisting during natural disasters.

In November 2013, the World Food Program (WFP), the food assistance branch of the United Nations, distributed high-energy biscuits (HEBs) to populations affected by Typhoon Haiyan.

Some 44 tons of HEBs — enough to feed 120,000 people for a day — were flown in to the Philippines capital of Manila. HEBs are precious in the early stages of an emergency as they are nutritious, need no cooking, and are easy to transport. They contain all the vitamins and nutrients survivors needed to make it through the aftermath of this emergency.

Energy for Life

Human beings need energy to survive — we use it to breathe, move, pump blood, and maintain cells. We acquire this energy from food. The number of **calories** in a food is a measure of how much potential energy that food possesses.

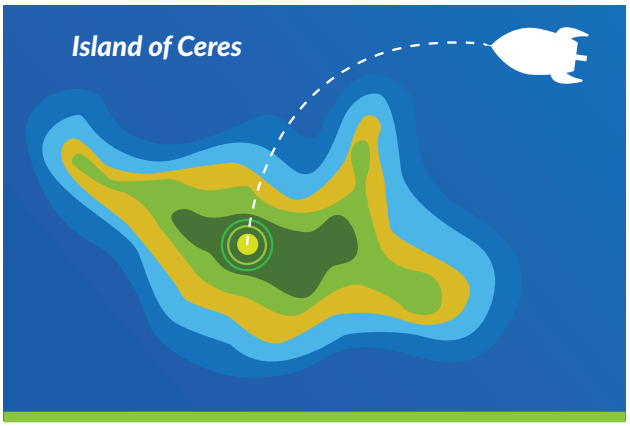
Foods are a compilation of three basic building blocks — carbohydrates, proteins, and fats — along with other micronutrients. If you know how many carbohydrates, fats and proteins are in any given food, you know how many calories — or how much energy — that food contains.

Did You Know?

Carbohydrates, proteins, fat — they all add up!

1 gram of CARBOHYDRATES has	1 gram of PROTEIN has	1 gram of FAT has
4	4	9
CALORIES	CALORIES	CALORIES

Identify the problem



Think back to your original challenge — a small group of people are isolated on a Pacific atoll called Ceres. A major storm has crippled their transportation and communications systems, cutting the inhabitants of this island completely off from all food deliveries. These people are close to starvation.

Thanks to previous rescue drops, they now have access to potable water. But **macronutrients** (nutrients that your body uses in relatively large amounts such as carbohydrates, protein and fats) are in short supply.

Your group has been tasked with putting together a food rescue package that weighs 30 grams. It needs to be packed with energy, taste good, be easy to transport, and require no cooking. Cost is also a factor because you will potentially be making multiple deliveries of these rescue packages. You will be expected to calculate a total energy-to-weight ratio (in grams), and you will identify grams of protein, carbohydrates, and fats, and cost per gram of your food payload.

After your team has researched and assembled your food rescue package, you will use your previously designed propulsion system and payload capsule to deliver your package to the targeted destination.

PART ONE: ENERGY BAR RESEARCH

The first step is to research the nutrient content of high-energy bars available in your area. Your job is to select one that passes your team's taste test, provides high energy, and is cost effective. All three components are important.

Step 1: Check the label.

A key concept to think consider is high-energy-to-weight ratio of your rescue food payload (this ratio is *calories:grams*). Your rescue package should be high in energy — it should have a significant proportion of protein and can be high in carbohydrates, but should not include too much fat. It also needs to weigh exactly 30 grams. Where can you find this information? On the food label!

Step 2: Check the cost.

Are there any specific steps we should be highlighting here in terms of costs? I notice in the chart we reference cost/gram – what sort of computations do we want them to perform?

Step 3: Compare the taste.

Conduct a taste test with the members of your team. Rate each bar on a scale of 1 to 10 (10 being great, 1 being not so great).

Step 4: Record your data.

Record your information in the following chart:

Nutritional Comparisons of Energy Bars

Energy Bar Type	Total Weight	Calories	Total Fat	Total Protein	Carbohydrates	Cost/ gram	Taste (1-10)	Calories/ gram
White Chocolate Macadamia Nut Clif Bar	68 grams	250	7 grams	9 grams	41 grams	2.99 /68 = 0.043	7	3.68

Step 5: Review and reflect.

Share what you've learned with the group.

1. How can your team maximize energy within the food weight limitation?
2. What foods are high in key ingredients yet lightweight?
3. Why is taste such a subjective value? Do you think this matters to a starving population?
4. What factors influence cost? How can you reduce the cost of your payload?

PART TWO: DELIVER THE GOODS

After your team selects and purchases the energy bar you plan to use, you need to design and build a craft that is capable of carrying the payload.

Step 1: Weigh in.

Cut off a 30-gram sample of the energy bar. This will be your payload.

Step 2: Divide and design!

Design, construct, and test your new payload container. Your new payload container should be able to carry your 30-gram energy bar sample.

Use this area to **create sketches and designs of your proposed payload container**.

Step 3: Build your payload container.

The next step is to build your design using only the materials that have been provided in your FTD Construction Kit.

Step 4: Launch your FTD.

When your team is ready for another launch, return to the testing area. Similar to previous experiments, you should test and launch your FTD as many times as you need to until you achieve a design that works.

Inspect the contents of your capsule to see how well your payload survived the launch and impact. Award points are given for accuracy and food integrity.

Step 5: Record your data.

Record your data using the chart below.

Team Name: **FTD Name:**
Location of Launch (indoors/outdoors) **Wind Conditions (if outdoors):**
Team Members:

Trial #	Angle of Launch Tube *(in degrees)*	Position of FTD on Launch Tube *(all the way, half-way down, ¼)*	Person Stomping on Bottle	FTD Design and/or Adjustments Since Previous Launch/Trial	Points Scored *(0, 1, 3, or 5)* and Observations
1					
2					
3					
4					
5					
6					
7					
8					

SAFETY FIRST!

Always wear safety goggles when launching your FTD.

Step 6: Review and reflect.

After everyone has finished launching and testing their FTDs, take a few minutes to review and share what you have observed.

TALK ABOUT IT

- What did you find to be the greatest challenge in this activity?
- What other resources would have been useful in this challenge?
- What obstacles did you encounter?

Step 7: Apply what you learned.

What has your research on emergency foods taught you about the foods you eat regularly? How might your food choices change in the future as a result of what you learned during this activity?

GLOSSARY

Energy – The content from macronutrients needed to sustain metabolism and muscle development.

Micronutrients – Nutrients in foods like vitamins and minerals, usually measured in milligrams or micro-grams.

Nutrient – A chemical that an organism needs to live and grow or a substance used in an organism's metabolism which must be taken in from its environment. There are six major classes of nutrients: carbohydrates, fats, minerals, protein, vitamins, and water.

Nutrient density – The amount of nutrients you get from a food given the number of calories it contains.

Nutritional science – The study of nutrition and foods.