NASA'S

BEST

STUDENTS

BEGINNING ENGINEERING,
SCIENCE, AND TECHNOLOGY

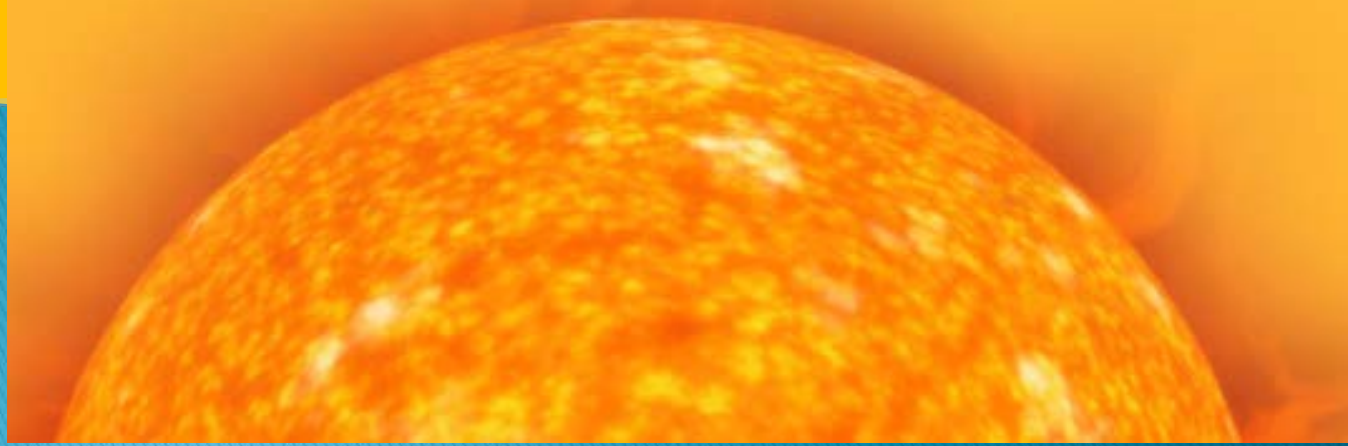
ENGINEERING DESIGN PROCESS


A day
without Fusion
is like a day
without Sunshine

Green house effect

Can we cook while on the Moon?

While astronauts might have to bring just about everything with them when we establish a habitat on the Moon, one thing they won't need is solar energy. There may be no atmosphere, no climate nor weather on the Moon, but that DOES make it an ideal place to collect solar energy. Much of the Moon is exposed to sunlight constantly, except briefly during a rare lunar eclipse. If that energy could be harnessed, it could power almost everything in the lunar habitat...including that most important device that helps prepare delicious food – an oven!



THE CHALLENGE:

Your mission is to design and build a solar oven to cook your own S'mores with the materials provided. Your design constraints are:

DESIGN challenge

To design and build a solar box cooker, and test it to see if it works well enough to make S'mores!

1. *The oven must have a "footprint" of no more than 40 cm*
   Be no larger than 35cm x 23cm x 23
2. *In 10 minutes, the temperature inside the oven must increase by 15 °C.*
3. *Your food may not touch the bottom of the oven directly. You must design an effective way to cook the two S'mores without their touching of the oven bottom.*
4. *You must cook the two S'mores at two different heights. You will also test which height allows food to cook at a faster rate.*

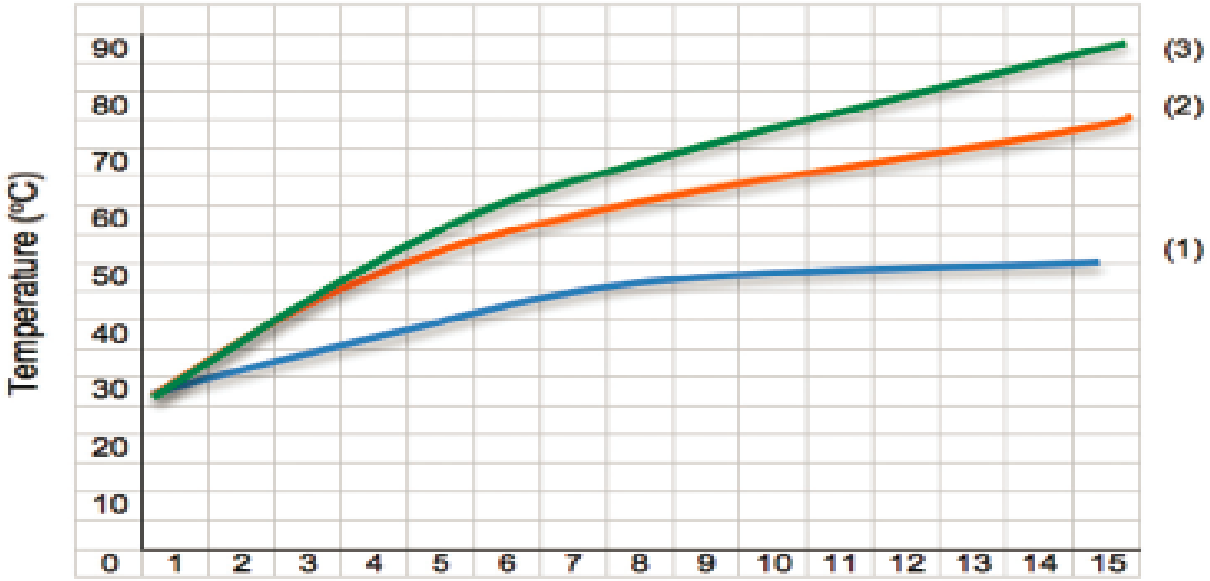
Build a Solar Oven
Student page

SAFETY NOTE: Contents of solar oven can get very hot. Make sure you use oven mitts or other protective wear when manipulating anything inside of your oven!

ASK IMAGINE &PLAN

What questions do you have about today's challenge?

Below is a graph showing data that demonstrates the efficiency of three different solar oven designs: (1) plain box, (2) box with a black bottom and (3) a box with aluminum foil and a black bottom.



Which line (1, 2 or 3) do you think represents the solar oven that is just an empty box? Explain why.

Which line do you think represents the solar oven with aluminum foil and a black bottom? Explain why.

What purpose do you think aluminum foil might serve?

How will you meet the design constraint of the food not being allowed to touch the bottom surface of the solar oven?

Draw and label your solar oven.

Approved by: _____

Experiment & Record

1. Using the materials provided, build you solar oven based on your design. Remember the goal is to capture heat in your oven.
2. Record the starting temperature of the oven: _____ °C
3. Record the heights of the food from the oven floor: _____ cm _____ cm
4. Prepare your S'mores and place them in the oven. Cover the oven with the plexiglass lid or plastic wrap and begin cooking.

5. Record the temperature change in the table below.

Solar Oven Data Table

Time Min:sec	Oven Temperature °C	Time Min:sec	Oven Temperature °C
0:00		5:30	
0:30		6:00	
1:00		6:30	
1:30		7:00	
2:00		7:30	
2:30		8:00	
3:00		8:30	
3:30		9:00	
4:00		9:30	
4:30		10:00	
5:00		10:30	

olar Oven

Record any observations of your food while it is cooking. These observations will help to determine which food placement height allows for quicker cooking.

Time Min:sec	S'more 1 _____ cm	S'more 2 _____ cm
1:00		
2:00		
3:00		
4:00		
5:00		
6:00		
7:00		
8:00		
9:00		
10:00		

QUALITY ASSURANCE FORM

Each team is to review another team's design and model, then answer the following questions.

Name of team reviewed: _____

	YES	NO
Did the solar oven increase in temperature by more than 10 °C?		
Did this team's design differ from your team's design?		
Did both S'mores melt?		

Which height/cooking position worked best in this solar oven?

List the specific strengths of the design:

List the specific weaknesses of the design:

How would you improve the design?

Inspected by: _____

Signatures: _____

_____

_____

The sky's no limit for

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