

# **STEM Outreach Activities to Inspire Future Engineers and Scientists**

**Lockheed Martin Advanced Technology Laboratories**



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# Lockheed Martin Advanced Technology Laboratories

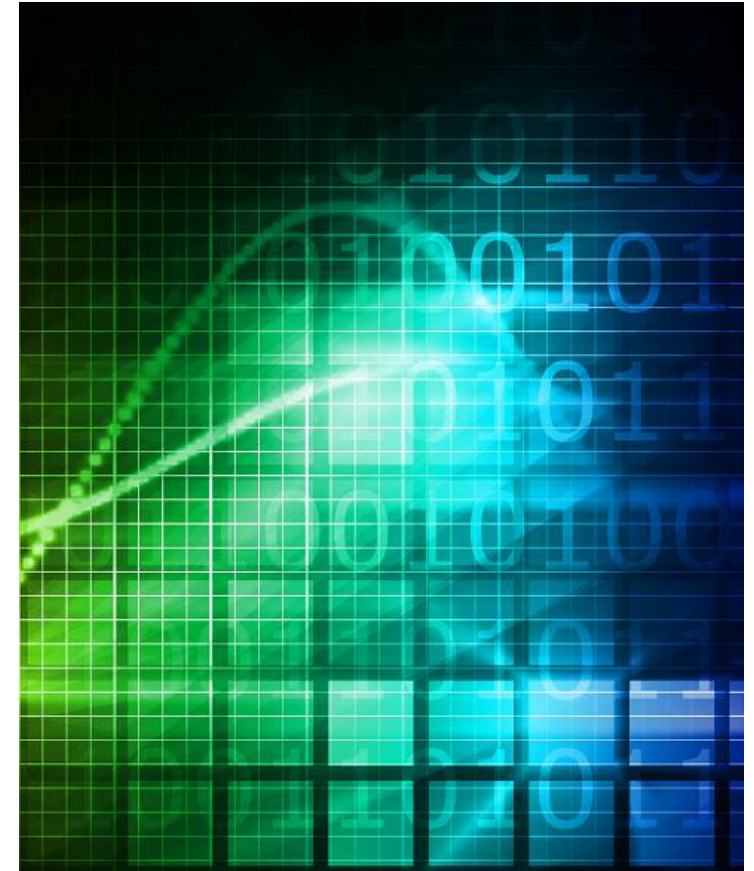


Engineers and Scientists at Lockheed Martin Advanced Technology Laboratories (ATL) advance scientific discovery and technology transition in:

- Cyber
- Materials Science
- Robotics and Autonomy
- Spectrum Systems
- Data Analytics

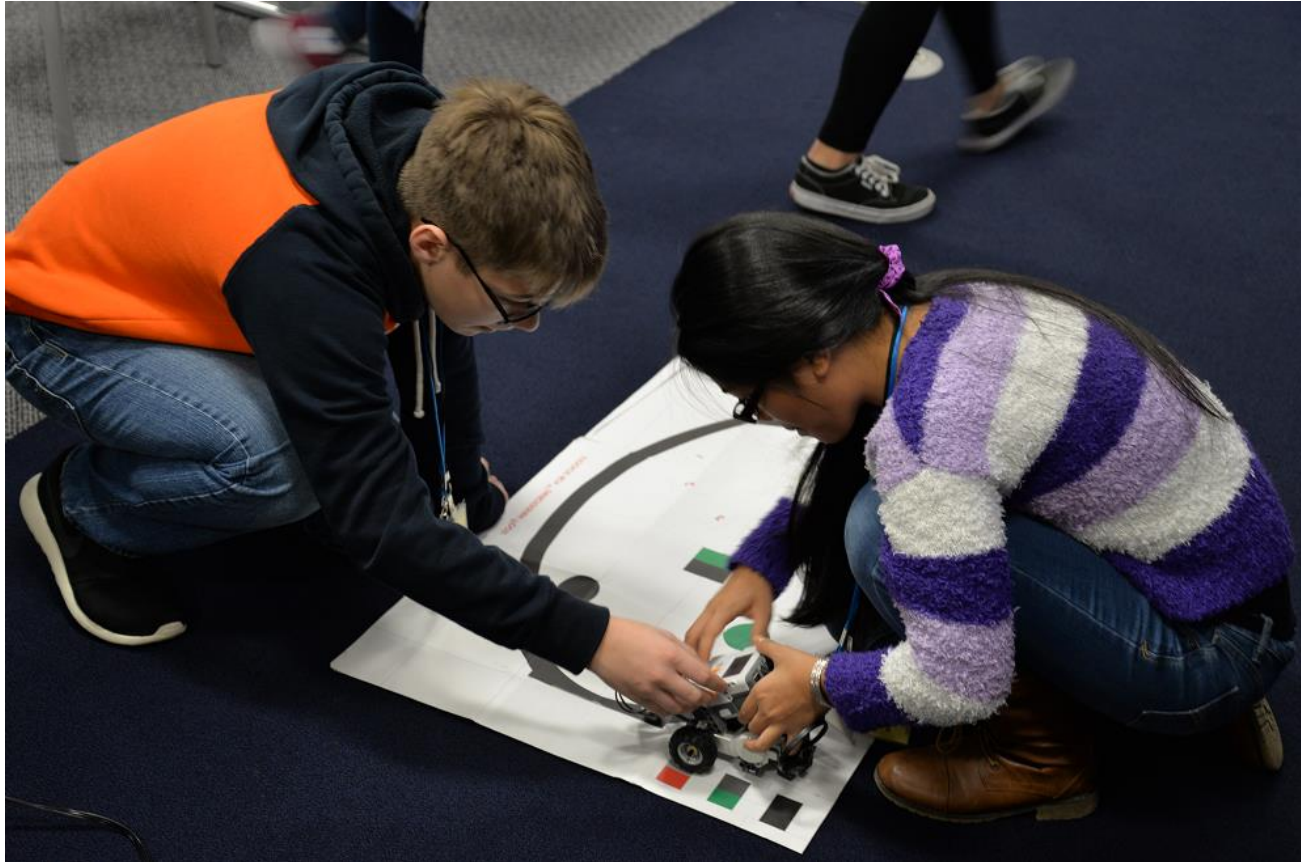
We embrace diversity of thought and have expertise in:

- Computer Science
- Electrical Engineering
- Physics
- Mathematics
- Artificial Intelligence



*We look far into the future—envisioning transformational technologies. And while we don't know exactly what will change the world next, we're probably already working on it.*

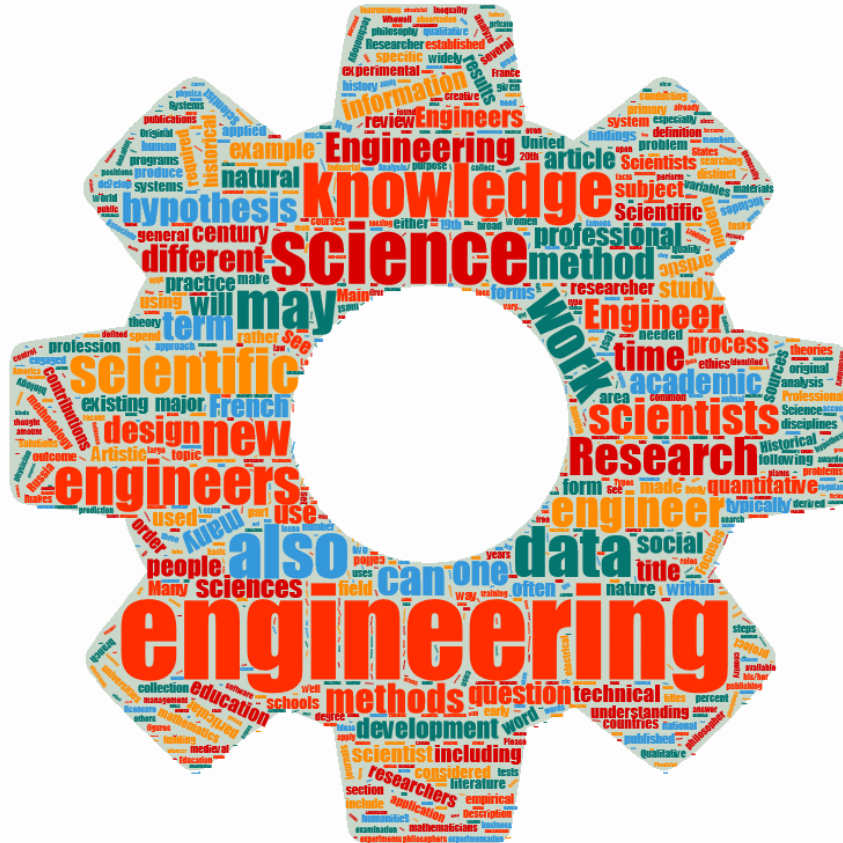
# Inspiring Future Engineers and Scientists



- **We expose Middle School students to engineering activities to inspire them to select advanced math and science classes when they enter High School.**
- **Education, not natural ability, is key to careers in engineering and science.**

***We hope more students will pursue careers in engineering and science as a result of our outreach efforts.***

# Engineering, Science and Research



- Passionate
- Creative
- Original
- Independent
- Attention to Detail
- Curious
- Problem Solving
- Focused
- Teamwork

***Research Engineers & Scientists are ALWAYS learning!***





# ATL STEM Outreach Activities



- **ATL Robotics Workshop**
- **Futures Fest**
- **Engineers in the Classroom**
- **USA Science and Engineering Festival**

*We want to expose as many students as possible to careers in engineering and science.*

# Robotics Workshop Program Goals



- For more than a decade, Lockheed Martin volunteers work with Middle School Students on this five-week program focusing on engineering concepts through lessons, activities and competition.
- Students are taught the fundamentals key to robotic applications and software design.
- This is a fun, fast-paced, team-driven, supportive environment.
- They enter with little to no experience and leave with a basic understanding to bolster excitement and intrigue in science and engineering careers.

***We encourage team work, patience and having fun MORE than winning.  
The competition is secondary to the workshop.***

# Robotics Workshop Schedule

- The program consists of four lessons and five competitive events on five consecutive Saturday mornings.
- Each week the students begin with a warm-up exercise designed to stimulate their minds to solve a problem. Then the students work in assigned four-person teams.
- At the conclusion of each session, the students are faced with a challenge that either pits them against the clock or the other teams.
- We give interesting lunchtime presentations, like teaching them Scratch programming <https://scratch.mit.edu/>



During the fifth week, teams apply all of the knowledge they gained about programming and sensors into a final event with tasks that involve all of the previous lessons.



# 3D Printing



- 3D Printers are already changing the world!
- On-line services
  - plastic, metal, paper...
- Entering local retail market
  - Some models cost less than \$500
- Public availability increasing
  - School districts
  - Local libraries
- Free on-line design tools
  - [www.TinkerCAD.com](http://www.TinkerCAD.com)
  - [www.SketchUp.com](http://www.SketchUp.com)
- The next generation is READY!!!

**3D printing provides a way to turn creative thoughts into reality, while simultaneously developing engineering skills in a fun way!**



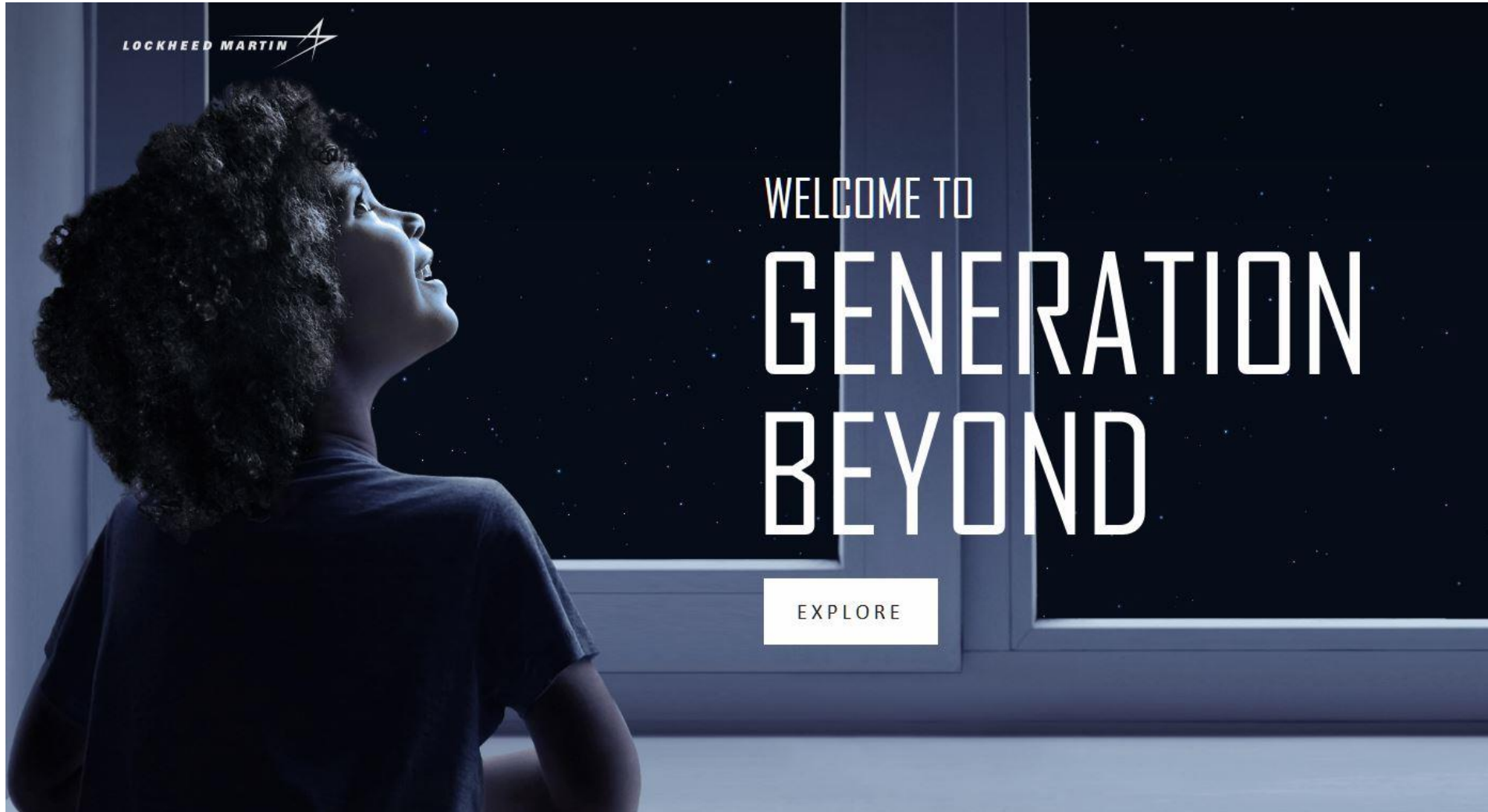


# 3D Printing Links

- **3D Design Communities:**  
Thingiverse  
<http://www.thingiverse.com/>  
  
YouMagine  
<https://www.youmagine.com/>
- **3D Printing Contractor:**  
Shapeways  
<http://www.shapeways.com/>
- **Free 3D CAD:**  
TinkerCAD  
<https://www.tinkercad.com/>

# Generation Beyond

[www.generation-beyond.com](http://www.generation-beyond.com)



# Lesson Plans for Space Exploration



## DIGITAL LESSON PLAN

Challenge your students to solve real-world problems, and encourage a deeper understanding of how space flight leads to innovation here on Earth.

[DOWNLOAD LESSON PLAN - PPTX](#)



## DIGITAL LESSON PLAN—COMPANION EDUCATOR GUIDE

Download for lesson plan and implementation support, including answer keys, discussion topics, and more.

[COMPANION EDUCATOR GUIDE - PDF](#)



## FAMILY ACTIVITIES

Go beyond the classroom and extend learning with activities designed for families to complete together.

[HELP WANTED FAMILY ACTIVITY - PDF](#)

[LAUNCH VEHICLE FAMILY ACTIVITY - PDF](#)

**ORION EXPERIENCE**  
Explore the Orion space capsule and Lockheed Martin's commitment to going beyond. [LEARN MORE](#) →

**HELLO MARS APP**  
What's the weather on Mars? Download the Hello Mars App today.

[Download on the App Store](#) [ANDROID APP ON Google play](#)

[Lockheedmartin.com/GenerationBeyond](https://www.lockheedmartin.com/GenerationBeyond)





# **Engineers in the Classroom**

**Activities anyone can teach K-12 students**



# <http://www.classroomengineers.org>



The screenshot shows the homepage of the 'Engineers in the Classroom' website. At the top, it features the National Geographic and Lockheed Martin logos, along with the URL 'natgeoed.org | NationalGeographic.com'. Below this is the main title 'EITC Engineers in the Classroom' and navigation tabs for 'Engineers' and 'Educators'. A secondary navigation bar includes 'Activities', 'Game', 'Media', and 'Engineer Guide'. The main content area is titled 'Engineers in the Classroom' and includes a 'Multimedia' sidebar, social media icons, and a link to 'Audience versions of this page' for 'Educators'. A large image of a rocket launch is featured with the text 'Introduce the World of Engineering Discover the Work and World of Engineers'. To the right, an 'About this Project' section describes the partnership between Lockheed Martin and National Geographic, and lists resources available on the website.

- Explore this collection of hands-on activities designed for use in K-12 classrooms and informal education settings.
- Created in partnership between Lockheed Martin and National Geographic.
- Inspiring students to consider STEM-based careers.

# Some of the Activities Available to Anyone



## Grades K – 4

How Small is Small

Forces of Flight

Seltzer Rocket Lab

Wind Turbine Design and Testing

## Grades 5 – 8

Challenge: Robotics!

Space Weather and Magnetism

Nanotechnology: Using Refraction To Make Things Invisible

**Engineering Stomp Rockets**

Wind Energy Lab

## Grades 9 – 12

Nanotechnology Revolution: Graphene

Space Weather and Solar Activity

Exploring Newton's Law of Motion with Bottle Rockets

Engineering Wind

**Each project contains:**

- **Lesson Plans to Download**
- **Video of how to execute activity**
- **Customizable PowerPoint Presentation**

❖ **Most of the materials for these activities are inexpensive and easy to purchase.**



# Activity: Engineering Stomp Rockets

How does Newton's Third Law of Motion explain the launch of a stomp rocket? What is a projectile, and how can knowledge of Newton's Third Law be used to improve the distance that the stomp rocket travels?

<http://www.classroomengineers.org/media/engineering-stomp-rockets/>

Materials for this activity:

- Two 1-foot pieces of 1/2-inch PVC
- 90° elbow connector for 1/2-inch PVC
- 2-liter soda bottle
- Poster board, cardstock, or thin cardboard (as from a cereal box)
- Scissors
- Duct tape
- Masking tape
- Safety goggles
- Measuring tape or meter stick

