Start Your Engines!

This module is designed to help you explore how technology affects your life each day.

1. Choose A or B or C and complete ALL the requirements.
   
   A. Watch about three hours total of technology-related shows or documentaries that involve transportation or transportation technology. Then do the following:
      
      (1) Make a list of at least two questions or ideas from the show(s) you watched.
      
      (2) Discuss two of the questions or ideas with your counselor.

   Some examples include—but are not limited to—shows found on PBS (“NOVA”), Discovery Channel, Science Channel, National Geographic Channel, TED Talks (online videos), and the History Channel. You may choose to watch a live performance or movie at a planetarium or science museum instead of watching a media production. You may watch online productions with your counselor’s approval and under your parent’s supervision.

   B. Read (about three hours total) about transportation or transportation technology. Then do the following:
      
      (1) Make a list of at least two questions or ideas from each article.
      
      (2) Discuss two of the questions or ideas with your counselor.


   C. Do a combination of reading and watching (about three hours total). Then do the following:
      
      (1) Make a list of at least two questions or ideas from each article or show.
      
      (2) Discuss two of the questions or ideas with your counselor.

2. Complete ONE merit badge from the following list. (Choose one that you have not already used toward another Nova award.) After completion, discuss with your counselor how the merit badge you earned uses technology.
3. Do ALL of the following.
   A. Using the requirements from the above list of merit badges:
      (1) Tell your counselor the energy source(s) used in these merit badges.
      (2) Discuss the pros and cons of each energy source with your counselor.
   B. Make a list of sources of energy that may be possible to use in transportation.
   C. With your counselor:
      (1) Discuss alternative sources of energy.
      (2) Discuss the pros and cons of using alternative energy sources.

4. Design and build a working model vehicle (not from a kit).
   A. Make drawings and specifications of your model vehicle before you begin to build.
   B. Include one of the following energy sources to power your vehicle (do not use gasoline or other combustible fuel source): solar power, wind power, or battery power.
   C. Test your model. Then answer the following questions:
      (1) How well did it perform?
      (2) Did it move as well as you thought it would?
      (3) Did you encounter problems? How can these problems be corrected?
   D. Discuss with your counselor:
      (1) Any difficulties you encountered in designing and building your model
      (2) Why you chose a particular energy source
      (3) Whether your model met your specifications
      (4) How you would modify your design to make it better

5. Discuss with your counselor how technology affects your everyday life.

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Start Your Engines! Counselor’s notes

This module is designed to help you explore how technology affects your life each day.

1. Choose A or B or C and complete ALL the requirements.
   
   A. Watch about three hours total of technology-related shows or documentaries that involve transportation or transportation technology. Then do the following:
      
      (1) Make a list of at least two questions or ideas from the show(s) you watched.
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   B. Read (about three hours total) about transportation or transportation technology. Then do the following:
      
      (1) Make a list of at least two questions or ideas from each article.
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   C. Do a combination of reading and watching (about three hours total). Then do the following:
      
      (1) Make a list of at least two questions or ideas from each article or show.
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2. Complete ONE merit badge from the following list. (Choose one that you have not already used toward another Nova award.) After completion, discuss with your counselor how the merit badge you earned uses technology.

<table>
<thead>
<tr>
<th>Automotive Maintenance</th>
<th>Energy</th>
<th>Railroading</th>
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<tbody>
<tr>
<td>Aviation</td>
<td>Farm Mechanics</td>
<td>Small-Boat Sailing</td>
</tr>
<tr>
<td>Canoeing</td>
<td>Kayaking</td>
<td>Space Exploration</td>
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<tr>
<td>Cycling</td>
<td>Motorboating</td>
<td>Truck Transportation</td>
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<tr>
<td>Drafting</td>
<td>Nuclear Science</td>
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<tr>
<td>Electricity</td>
<td>Programming</td>
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</tbody>
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3. Do ALL of the following.
A. Using the requirements from the above list of merit badges:

(1) Tell your counselor the energy source(s) used in these merit badges.

*Automotive Maintenance*—gasoline, diesel fuel, electricity, blended gasoline, biodiesel, hybrid

*Aviation*—aviation fuel and kerosene

*Canoeing*—human power

*Cycling*—human power

*Drafting*—human power, electricity

*Electricity*—electromagnetism, chemical

*Energy*—biomass digesters, cogeneration, fossil fuel power, fuel cells, geothermal power, nuclear power, solar power, tidal energy, wave energy, ocean thermal energy, wind

*Farm Mechanics*—diesel fuel

*Motorboating*—gasoline, diesel fuel, blended gasoline, biodiesel

*Nuclear Science*—nuclear energy

*Railroading*—diesel fuel

*Small-Boat Sailing*—wind

*Space Exploration*—most common solid is ammonium perchlorate mixed with powdered aluminum

*Liquids for first-stage rockets*—RP-1

*Liquids for second-stage rockets*—liquid hydrogen, liquid oxygen

*Truck Transportation*—diesel fuel

(2) Discuss the pros and cons of each energy source with your counselor.

**Helpful Links**

*The following links are places to start. This not an exhaustive list.*

"Diesel Fuel vs. Unleaded Gasoline": CarsDirect.com

"Diesel Reborn": Edmunds.com
B. Make a list of sources of energy that may be possible to use in transportation.

C. With your counselor:
   1. Discuss alternative sources of energy.
   2. Discuss the pros and cons of using alternative energy sources.

Other sources of energy may include wind, solar power, and biofuels, which draw energy from what is called biological carbon fixation. The most common biofuel is ethanol from corn, although it can also come from sugar cane, sugar beets, wheat, molasses, potatoes, and fruit waste. Biodiesel sources include algae, animal and vegetable oil, hemp, flax, and sunflowers.

Helpful Links
The following links are places to start when researching alternative fuels. It is not an exhaustive list.

“A Student’s Guide to Alternative Fuel Vehicles”: California Energy Commission
Website: http://www.energyquest.ca.gov/transportation/index.html


Website: http://www.afdc.energy.gov/afdc/vehicles/electric_benefits.html

“Alternative Fuels”: U.S. Department of Energy
Website: http://www.fueleconomy.gov/feg/current.shtml
4. Design and build a working model vehicle (not from a kit).
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