



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.

Examples of magazines include—but are not limited to—Odyssey, Popular Mechanics, Popular Science, Science Illustrated, Discover, Air & Space, Popular Astronomy, Astronomy, Science News, Sky & Telescope, Natural History, Robot, Servo, Nuts and Volts, and Scientific American.

- 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.

Automotive Maintenance	Energy	Railroading
Aviation	Farm Mechanics	Small-Boat Sailing
Canoeing	Kayaking	Space Exploration
Cycling	Motorboating	Truck Transportation
Drafting	Nuclear Science	
Electricity	Programming	

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.

Start Your Engines! **Counselor's notes**

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 - (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.

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Aviation	Farm Mechanics	Small-Boat Sailing
Canoeing	Kayaking	Space Exploration
Cycling	Motorboating	Truck Transportation
Drafting	Nuclear Science	
Electricity	Programming	

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

Website: <http://www.carsdirect.com/car-buying/diesel-fuel-vs-unleadedgasoline-understand-the-pros-and-cons>

“Diesel Reborn”: Edmunds.com

Website: <http://www.edmunds.com/fuel-economy/diesel-reborn.html>

***“Electric Cars vs. Gasoline Cars and Other Vehicles”*: CarsDirect.com**

Website: <http://www.carsdirect.com/green-cars/electric-cars-vs-gasolinecars-get-the-facts>

***“Aviation Fuel”*: U.S. Centennial of Flight Commission**

Website: http://www.centennialofflight.gov/essay/Evolution_of_Technology/fuel/Tech21.htm

***“Aviation Jet Fuel Information”*: CSGNetwork.com**

Website: <http://www.csgnetwork.com/jetfuel.html>

***“Today’s Marine Fuel Choices”*: Boating & Sailing @ Suite 101**

Website: <http://www.suite101.com/content/todays-marine-fuel-choices-a27218>

***“What kind of fuel do rockets use and how does it give them enough power to get into space?”*:
Scientific American**

Website: <http://www.scientificamerican.com/article.cfm?id=what-kind-of-fuel-do-rock>

- 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>

***“Ethanol? Fuel Cell? Biodiesel? An Alternative Fuel Overview”*: Edmunds.com**

Website: <http://www.edmunds.com/fuel-economy/ethanol-fuel-cell-biodiesel-an-alternative-fuel-overview.html?articleid=110054&>

***“Alternative & Advanced Vehicles”*: U.S. Department of Energy**

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>

“Alternative Fuel”: Popular Mechanics

Website: <http://www.popularmechanics.com/cars/alternative-fuel>

“NASA: alternative fuels for aviation”: Post Carbon Institute

Website: <http://www.energybulletin.net/node/23098>

“Alternative Fuels for Aviation”: Aviation Week

Website:

http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=bca&id=news/bca0907p3.xml&headline=null&prev=10

“An Introduction to Solar Energy”: Eric W. Brown, Northeastern University

Website: <http://www.ccs.neu.edu/home/feneric/solar.html>

“How Solar Panels Could Power 90% of US Transportation”: Gas 2.0

Website: <http://gas2.org/2008/03/25/how-solar-panels-could-power-90-of-us-transportation>

“Nuclear Power: A Leading Strategy to Reduce Oil Imports”: American Nuclear Society

Website: <http://www.ans.org/pi/ps/docs/ps82.pdf>

“Wind Power for Cars”: Wind Power Authority

Website: <http://windpowerauthority.com/wind-power-for-cars>

“Denmark to power electric cars by wind in vehicle-to-grid experiment”: The Guardian

Website: <http://www.guardian.co.uk/environment/2009/jun/19/denmark-windelectric-Cars>

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Last Modified 2018 Nov 26