

Fuels and Fuel Delivery Systems

Explorers will be introduced to the basics of gasoline engine combustion and the way in which fuel is delivered to the engine.

CATEGORY

- Auto Technology
- Fuel Systems

OBJECTIVES

By the end of this session, participants will be able to:

- Explain the relationship between air intake and combustion.
- Replace a fuel filter.
- Describe the components of a fuel delivery system.

SUPPLIES

- Activity 1
 - Five tea lights or votive candles
 - Matches or lighter
 - Three clear plastic cups, prepared with holes as noted in the activity
- Activity 2
 - Proper safety equipment for each participant (i.e., eye and ear protection, gloves)
 - Demonstration vehicle
 - Fuel injector and tools for removal and installation
 - Cleaning materials for fuel injector
 - Fuel filter and tools for removal and installation
 - Copies of the **Fuel Tank** diagram and a pen or pencil for each Explorer

ADVISOR NOTE: Text in italics should be read aloud to participants. As you engage your post in activities each week, please include comments, discussions, and feedback to the group relating to **Character, Leadership, and Ethics**. These are important attributes that make a difference in the success of youth in the workplace and in life.

ACTIVITIES

Activity 1

Combustion

This activity is intended to get your Explorers engaged and to serve as a lead-in to the main event.

Give a small tea light or votive candle to each of three Explorers and two tea lights or votive candles to one Explorer. Have them place their candles on a flat surface or the ground. The Explorer with two candles needs to place the candles close to each other so that the cup will cover both of them at the same time. Give three of the four youth a clear plastic cup, including the youth with two candles. The cups should be modified as follows:

- Two cups with a 1/8-inch hole cut into the bottom of the cup
- One cup left fully intact (no holes)

The combination of Explorers, candles, and cups should be as follows:

- Explorer No. 1—One candle, no cup
- Explorer No. 2—One candle, one unmodified cup
- Explorer No. 3—One candle, one cup with a hole in it
- Explorer No. 4—Two candles, one cup with a hole in it

Light all five candles and on your signal, have each Explorer with a cup place it over their candle(s). Let the candles burn for 30 to 60 seconds and observe what happens.

Extinguish any candles that are still burning and ask the questions that lead into the meeting's main event.

Activity 2

Main Event

Begin the main event by asking the following questions:

- *How long did each candle burn?*
- *Why did some candles burn longer than others?*
- *Was there a difference between the burn time of the two-candle setup and the similar single-candle setup?*

Try to guide the discussion toward the conclusion that both the amount of fuel and the available oxygen have an effect on the quality and efficiency of the energy (heat in this case) that is produced. This is why a properly designed and functioning fuel system in a car is so important.

It is important that your Explorers have the opportunity to get their hands dirty and actually experience the workings of the air intake and fuel system. As you explain the principles of the fuel system, allow each Explorer to complete each of the tasks listed below.

Principle	Activity
Fuel atomization and metering	Clean or replace a fuel injector
Importance of clean air in combustion	Blow out or replace air filter
Importance of clean fuel in combustion	Replace fuel filter
Transfer of fuel from the tank to the engine	Label the Fuel Tank diagram

When you are done, give each participant an opportunity to identify each of the parts you have worked on and explain their function. Allow time for questions.

ADVISOR NOTE

Some sample questions are below. They are designed to help the participants apply what they have learned to their own interests. You are welcome to use these questions or develop your own questions that relate to your post or specific focus area.

REFLECTION

Focusing Questions

- *What did you learn about fuel systems that you didn't know before?*

Analysis Questions

- *How is fuel combustion more or less complicated than you thought?*
- *What components of the fuel system do you think would require the most frequent servicing?*
- *How can a thorough understanding of fuel delivery systems make you a better technician?*

Generalization Questions

- *What additional training could you take to learn more about fuels and fuel systems?*
- *What subjects in school do you believe would be relevant to gaining a better understanding of the function of fuel delivery and combustion?*

ADVISOR'S PARTING THOUGHT

Share the following thought:

Each time a driver inserts the key into the ignition, he or she expects the vehicle to start right up. We often take for granted everything that must be present or must function properly for that to happen. What if the fuel injectors weren't measuring the proper amount of fuel, or the fuel pump didn't pump gas from the tank? What would happen if the air filter didn't do its job and allowed dirt to enter the system?

Just as we depend on mechanical systems to work right every time, those around us expect us to function in our roles on a consistent basis too. We are expected to show up to work and school. We need to work hard and do our part. When we commit to something, we need to make sure we complete it. It may be a group project at school, a chore at home, or keeping a promise to a friend or employer.

Being dependable doesn't mean just doing our job when it's convenient. It means doing our job so well and so consistently that others can count on us no matter what. It means being so reliable that others can take our performance for granted, just like we do with our fuel systems.

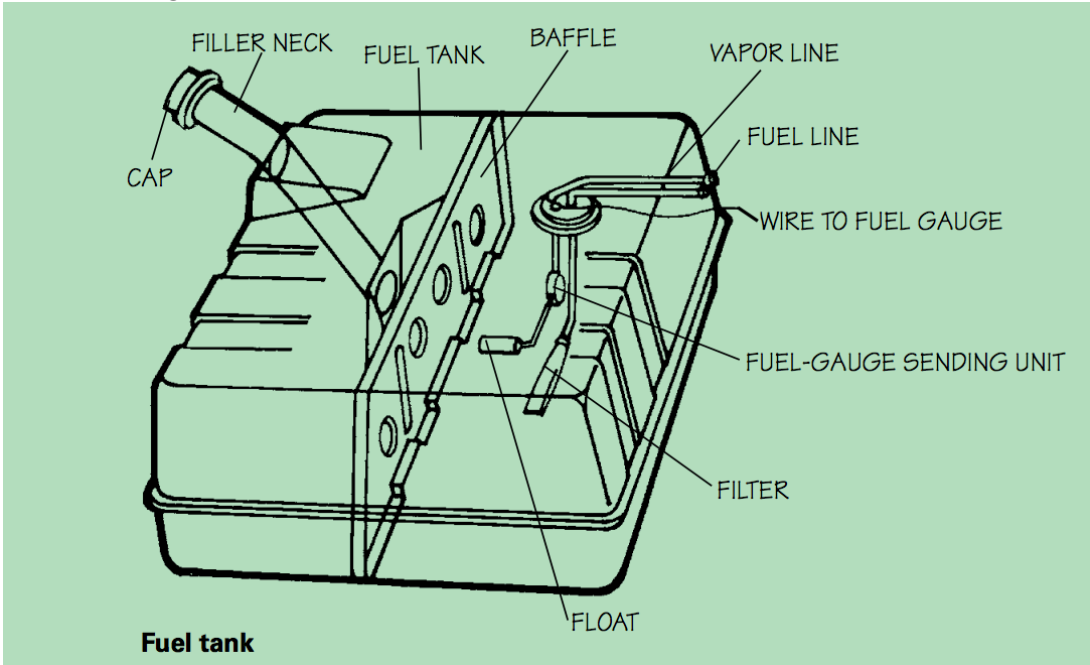
ADVISOR AND OFFICER REVIEW

After the meeting, address the following:

- Identify what was successful about the meeting.
- Identify what needed improvement.
- Schedule an officer and Advisor planning meeting to prepare for the next post meeting or activity.

RESOURCES

Fuel Tank Diagram



(Source: John McDearmon)