

Chapter Six

electric tip tank fuel pump. More than one pilot has turned on all fuel pumps prior to takeoff and simply left them on, which in some aircraft may be an appropriate procedure. In this case, the fuel in the tip tanks will be forced into a full main tank, causing main tank fuel to vent overboard through the fuel vent. The result would be fuel dumping and a potentially dramatic decrease in endurance performance. It is important to know as much about fuel and your fuel system as possible, so let's start with the basics.

CHEMISTRY OF COMBUSTION

It is a common belief that a few million years ago T-Rex, Godzilla, and a bunch of other dinosaurs died when an asteroid hit earth and caused a new Ice Age. They got buried, rotted, mystically turned into petroleum, and we now pump them into our gas tanks, which lends precious little credence to one gas company's slogan: "Put a tiger in your tank." Contrary to what most people believe, however, the jury is still out on where petroleum came from. One thing is for sure: The dark, greenish-brown viscous fluid contains many hydrocarbons, and hydrocarbons mean fuel.

There are three primary classifications of fuel: solids, gases, and liquids. Let's face it; flying would lose a lot of its appeal if you had to shovel coal while doing it. And while there have been some earnest experiments in using gaseous fuels such as propane, of the three, the one best suited for use in aircraft are liquid fuels. Avgas (aviation gasoline) is one of a number of hydrocarbon compounds obtained from petroleum. There are actually quite a few methods of producing gasoline from crude oil, but the most commonly used are fractional distillation and thermal cracking.

Fractional Distillation

Fractional distillation is a process whereby the crude petroleum is heated, vaporized, then condensed (Figure 6-1). A specific hydrocarbon liquid—for instance, gasoline—will vaporize at a given temperature. So when the crude petroleum is heated and held at that temperature, the liquid that condenses out will be gasoline. When all of the gasoline has been distilled out, the petroleum temperature can be raised and a different, heavier hydrocarbon liquid such as kerosene will condense out, and so on.

During the relatively short period since the discovery and use of crude petroleum began, many of the less sweet (very clean) oil reserves have been depleted. That is not to say that there isn't still a lot of crude oil available throughout the world, but the quality, type, and quantity of the fractions that can be obtained from different sources of crude differ. Refiners naturally prefer to use crude that will give the greatest yield for the least cost. Since the cost of operating a refinery tends to increase with inflation, as time goes on the remaining, less productive crude will naturally yield more costly products.

Even though fractional distillation appears to be a simple process, it is actually relatively expensive because it is not very efficient at extracting, for instance, all of the possible gasoline in a given volume of crude petroleum.