INNOVATION NATION
Biofuel

With international petroleum production on the decline, consumption on the rise, and in light of fossil fuel depletion, learn what alternative energy sources are being researched and used already. Biofuel is any solid, liquid or gaseous fuel derived from biological material, mostly plant matter. It is renewable and burns cleaner the petroleum.

Owner of *Prairieland Motorsports*, Kevin Therres, an auto mechanic and a drag racing enthusiast demonstrates the power of his Prairie Gold Jet Truck. This F4 to F150 Ford, housing a Pratt & Whitney jet engine in a fiberglass body can go 230-260 mi/hr, powered entirely by Biodiesel engine fuel "Prairie Gold." See the process of extracting oil from canola seeds and converting it into diesel at *Milligan Bio-Tech*, producer of "Prairie Gold." This fuel increased the life of the jet truck engine by 25-30% and indeed may have saved Kevin's life when aerodynamics issues made the vehicle get out of control and hit the wall, sparks flying. The reason the jet truck did not reignite is that the flashpoint of Biodiesel is higher than that of regular jet fuel.

The viability of biofuels for extreme condition vehicles has been questioned. Doug Redonte, president of *Green Flight International* demonstrates the BioJet, a versatile L29 military trainer that can use variety of fuels and is therefore a perfect aircraft for biofuel testing. Biofuels in the extreme conditions of flight. Can a jet fly entirely on Biofuels? Will it perform in cold temperatures of high altitude? The freezing point of biofuel is at a temperature a little higher than of diesel or jet fuel, but the aircraft has fuel heaters, so it does not become a problem. The *Green Flight Team* first tests the engine on a stand, then takes the BioJet on a test flight of 17,000 ft that proves that biofuel works in a jet. To then embark on a transcontinental flight, the team must be absolutely confident in fuel safety, because they would be flying over populated areas. After rigorous ground testing, they set out from Reno, Nevada to Leesburg, Florida – a distance of roughly 2,500 miles. The first 2,000 miles it flew were powered by 100% bio diesel (soy, canola, animal fat); the last 700 miles—by a 50/50 blend of bio diesel and jet fuel to compare performance. This test proved bio diesel safety in extreme environments. Now the next test to take is supersonic flight that will require a larger engine and refined advanced biofuels.

Major criticism of Biofuel energy brings attention to the threat of food crop displacement by fuel crops, which would lead to high food costs and inflation. Erik Andersen, an Eco Farmer on SamsØ Island, Denmark, makes diesel out of rapeseed, Europe's chief oilseed fuel crop, on his very own farm. 1st generation biofuels like rapeseed and canola based fuels are at the heat of food vs. fuel crop controversy. 2nd generation biofuels, however, are derived from waste products.

Steve Maggs & Kerry Kirwan demonstrate the brainchild of World F3rst Project at Warick University in Coventry, England—an eco-friendly Formula 3 racecar. Its steering

wheel is made of carrot fiber, the body panel from recycled materials, and other components from flax and soybean extracts. And it runs entirely on 2nd generation biofuels, and is thus known as “Chocolate Car.” Its mission is to show that environmentally friendly is not slow and boring.

Learn what materials produce 2nd generation fuel. Kjær Anderseasen, Managing Director at Daka Biodiesel, describes how the process of refining animal fat leftovers from slaughterhouse industry produces a one-to-one amount of biodiesel. The company also extracts biogas from manure.

Soybean crops would need to cover half USA to support all of our diesel needs through biofuel. Phototrophic Algae farming, on the other hand, would cover all our petroleum needs and require an area roughly the size of Maryland. Algae can be grown in closed controlled environments at an amazing rates, and there are over 200 companies dedicated to producing algae fuels in US today.

Questions:

Q: List the Biofuel Sources.
A:

- Algae
- Seed crops (Canola, Rapeseed)
- Jatropha
- Sea Weed
- Bacteria
- Sewage waste

Q: Which fuel source requires less refining process – animal fat or plant material?
A: Plant material

Q: What has a higher freezing point temperature – biofuel or jet engine?
A: Biofuel

Q: What has a higher flashpoint temperature – biofuel or jet engine?
A: Biofuel