



A National Strategy Is Required to Address Obstacles to Sustainable Alternative Aviation Fuels

An AIAA Information Paper

Overview

There is little doubt that the United States must create a sustainable alternative aviation fuels program to protect our national energy security and address economic issues. Because it accounts for only a small percentage of overall fuel usage (2–3%), aviation is well-positioned to be an early industry to transition to alternative fuels. Worldwide the aviation industry consumes 1.5–1.7 billion barrels (roughly 70 billion gallons) of traditional jet fuel (Jet-A) annually. In 2008, the U.S. Air Force spent over \$9 billion for energy, over 80% of which was for aviation fuel. Currently, aviation fuel is petroleum-based, with the majority of suppliers located outside of the United States. Many of these supplier nations would not otherwise be considered allied to U.S. interests. Recognizing the need for domestic supplies of aviation fuel, the U.S. Air Force has directed that by 2016 at least 50% of its fuel must be obtained from alternative domestic sources.

Background

Over the past several years, multiple sources of alternative feedstocks have been considered. There is general agreement that this nation's fuel situation will not be resolved by only one feedstock. Companies large and small are researching and developing feedstocks from sources as diverse as coal, algae, wood pulp, and garbage. Government interest has also increased, with a number of federal agencies – Department of Defense, Department of Energy, Department of Agriculture, Federal Aviation Administration, Environmental Protection Agency – currently involved in some fashion. However, the various agency roles do not appear to be coordinated into a national strategy to address a domestic replacement for legacy aviation fuels. With no clear national mandate, coordination across agencies and with the private sector is less than optimal. A comprehensive approach with good science, the right metrics and multiple cost-effective measures is needed.

A number of government agencies already have programs in place to examine feedstock production, develop roadmaps and life cycle assessments, and test and evaluate alternative fuel. Last year the USAF Interagency Aviation Fuel Life Cycle Assessment Working Group released a "Framework and Guidance for Estimating Greenhouse Gas Footprints of Aviation Fuels." The Commercial Aviation Alternative Fuels Initiative (CAAFI), is a coalition of airlines, aircraft and engine manufacturers, energy producers, researchers, international participants and U.S. government agencies. CAAFI has developed a series of roadmaps that provide overview and detailed projections of milestones leading to successful development and deployment of alternative aviation jet fuels in anticipation of sustainable quantities in the near future. But one of the greatest obstacles is the available supply of sustainable feedstock to produce the quantities of fuel needed at affordable prices.

Whether carbon-based feedstock such as coal, shale or natural gas; or biofeedstock such as camelina, jatropha, soybeans, algae or a number of others, similar environmental and economic issues must be considered and resolved, as shown in Figure 1. Understanding the issue of "scale" is critical as we move toward alternative fuels. While there will likely be multiple types of feedstock required, all will have to be scaled up to be sustainable. This, in turn, raises increased environmental concerns relative to local water supply usage, direct and indirect

land use change, soil and biodiversity impacts, air and energy balance. Regulations could delay or de-rail efforts to develop certain feedstocks and/or deploy alternative fuels. It is critical that regulators at all levels – local, state and federal - be involved early in the process.

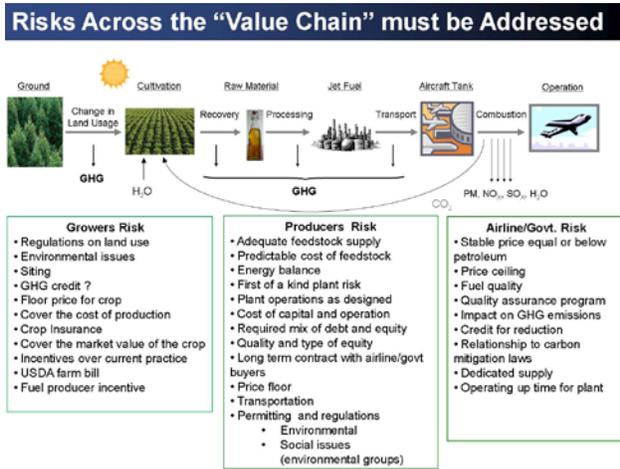


Figure 1: Risk considerations along the life cycle of an alternative fuel used in determining viability

There is also considerable risk at the producer level. To be economically viable as an alternative fuel, producers must be assured of adequate, sustainable feedstock. Developing viable alternative fuel is capital-intensive and incentives are required to encourage investment at all stages of production. On the purchasing side, both government and commercial consumers must be assured of stable fuel prices at or below that of petroleum. At the same time, they must be comfortable that the alternative fuel is truly a “drop in” replacement which will have no negative impacts on performance.

In order to develop and commercialize sustainable alternative fuels, research and development is also needed to address the externalities of scaled alternative fuel production – from stock genesis to fuel consumption. While a number of government agencies are engaged in research and development, enhanced coordination to tie together existing technology development roadmaps would be very useful. Roadmaps developed by CAAFI also identify a number of unfunded milestones that must be addressed if the vision for alternative fuels is to be realized.

Recommendations: AIAA recommends that Congress take the following actions:

- Direct relevant federal agencies to report on their existing alternative fuel roadmaps to (a) identify where gaps currently exist that may inhibit qualification, environmental performance definition, or deployment of alternative fuels, and (b) as the starting point for a comprehensive strategic national roadmap toward establishing specific fuel technology goals and guidelines.
- Ask relevant federal agencies and the private sector to identify where regulatory uncertainty may be inhibiting development and deployment of alternative fuels, and how that uncertainty can best be addressed.
- Direct relevant federal agencies to articulate a coordinated approach to execute environmental life cycle assessments to ensure that environmental regulatory uncertainty does not slow development and deployment.
- Provide tax policy incentives similar to those employed for ethanol and other renewable sources for jet fuel feedstock production and conversion to ensure that aviation has an equal opportunity in the marketplace. Also, institute other measures which will encourage the necessary capital investments in alternative aviation fuel production and delivery infrastructure.
- Direct relevant federal agencies to employ a comprehensive national strategy for production and distribution of alternative aviation fuels in partnership with the private sector.