

## Why GAO Did This Study

The federal government has encouraged the development and use of alternative fuels to reduce greenhouse gas emissions associated with aviation and to enhance economic development and energy security for the United States. To help achieve these goals of reducing greenhouse gas emissions, the aviation industry is actively supporting alternative jet fuels.

GAO was asked to provide information on the progress and challenges to developing and using alternative jet fuels in the United States. This report examines (1) the role of the federal government in the development and use of alternative jet fuels and (2) key challenges to developing and using alternative jet fuels and actions that the federal government plans to or could take to help address those challenges.

GAO interviewed officials from five federal agencies—FAA, USDA, DOE, DOD, and EPA. GAO selected these agencies for review because GAO identified them as the federal agencies most involved in the development and use of alternative jet fuels. GAO also reviewed relevant literature and federal and industry documents and discussed challenges and potential federal actions with 23 stakeholders from government, academia, and the private sector, selected to represent a range of perspectives and expertise in areas related to each step in the development and use of alternative jet fuels. GAO is not making recommendations in this report. DOT, USDA, DOE, DOD, and EPA reviewed a draft of this report and provided technical comments that were incorporated as appropriate.

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## ALTERNATIVE JET FUELS

### Federal Activities Support Development and Usage, but Long-term Commercial Viability Hinges on Market Factors

## What GAO Found

The federal government supports the development and use of alternative jet fuels through both broad and targeted initiatives. Broad national strategies promote the development of a variety of alternative fuels—including alternative jet fuel—to help achieve national goals, such as securing energy independence, fostering economic development, and reducing greenhouse gas emissions. In addition, the renewable fuel program—established by law in 2005 to encourage greater use of renewable fuels and administered by the Environmental Protection Agency (EPA)—requires that U.S. transportation fuels contain certain amounts of renewable fuels annually, increasing from 9-billion gallons in 2008 to 36-billion gallons in 2022. The other four federal agencies that GAO reviewed—Department of Transportation's (DOT) Federal Aviation Administration (FAA), Department of Agriculture (USDA), Department of Energy (DOE), and Department of Defense (DOD)—directly support alternative jet fuels through targeted goals, initiatives, and interagency and industry coordination efforts. For example, FAA set a goal for the U.S. aviation industry to use 1-billion gallons of alternative jet fuels annually by 2018. The four agencies also sponsor research that specifically targets alternative jet-fuel development or provide direct support for its future commercial production, or both. For example, FAA and DOD support research to determine the technical feasibility of using new alternative jet fuels on aircraft and in existing infrastructure. Also, USDA, DOE, and DOD have coordinated their activities to support the future construction or retrofit of multiple domestic commercial- or pre-commercial-scale production facilities to produce alternative fuels, including alternative jet fuels. Specifically, in May and June 2013, four private fuel producers received awards totaling \$20.5 million in federal funds, with private industry paying at least 50 percent of the cost.

Achieving price competitiveness for alternative jet fuels is the overarching challenge to developing a viable market. No alternative jet fuels are currently commercially available at prices competitive with conventional jet fuels. The 23 stakeholders that GAO interviewed most frequently cited high development costs and the uncertainty of federal regulations and policies as primary reasons why alternative jet fuels are not priced competitively and believe that federal activities are needed to help advance the alternative jet-fuels industry. For example, according to 10 stakeholders, fuel producers face difficulties in obtaining private investment to help construct commercial-scale fuel production facilities, in part because of concerns about the supply and high cost of feedstock (the source used to produce the fuel, such as crops) and high capital costs. Also, 13 stakeholders stated that continued uncertainty about the future of current federal policies—particularly the renewable fuel program—generally causes potential investors to discount the value of federal subsidies, discounting that, in turn, limits the support these policies may provide the industry. Stakeholders identified a variety of federal actions to advance alternative jet-fuels development, including continuing current federal research efforts, providing greater regulatory and policy certainty, and giving more direct financial support. However, even if the cost to produce alternative jet fuels is reduced, market factors may still determine the long-term success of the industry. The main market factors identified by stakeholders were (1) comparative value of competing end products, (2) feedstock prices, and (3) the costs of conventional jet fuels.