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Politics & technology: U.S. polices restricting unmanned aerial systems in agriculture

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ABSTRACT

Many industry observers foresee that agriculture worldwide is posed to substantially benefit from the use of unmanned aircraft systems (UASs), commonly known as drones. Industry special interests predict that 80% of domestic sales of UASs in the U.S. will be for agriculture. However, some fear that the public anxiety of the UAS operating in U.S. airspace could stall their introduction, a move that would potentially place some of American farmers' production practices at an economic disadvantage. Currently, this public policy controversy is influencing UAS integration into U.S. agriculture, with the potential of spilling over internationally.

This project examines the nature of the current debate surrounding the UAS within the U.S., analyzes the impact on agriculture from the legislation considered, discusses policy options to ameliorate the controversy, and describes the factors that will likely determine UAS operations within the U.S. The information was obtained from government documents, academic research, industry studies, nonprofit organizations, and media reports. An analysis was done using these data on how UAS legislation may affect agriculture.

Popularized images of the silent-kills overseas using militarized UASs, safety concerns, and a fear of privacy invasions were found to generate intense opposition to their domestic integration. Spurred by the FAA's congressional mandate to fully integrate UASs into the nation's airspace, a significant number of bills, particularly in state legislatures, have been introduced in an attempt to regulate UAS use. Although geared toward privacy protection and law enforcement, some laws may adversely affect agriculture because they create legal uncertainty and/or they sweepingly ban or highly curtail local UAS operations. Possible solutions have been proposed: (1) reducing the legal uncertainty regarding UASs, (2) adopting an industry Code of Conduct and Safe Practices, and (3) producing a consensus on UAS regulations among diverse groups through an open discussion of how to balance UAS operations with safeguards on privacy and property rights. The perceived economic potential of the UAS, particularly in agriculture, combined with the lobbying power of the UAS industry, strongly suggest that policy will eventually be developed that will allow the use of this technology for agriculture in U.S. airspace.

Introduction

Unmanned aircraft systems (UASs), also referred to as unmanned aerial vehicles (UAVs) or "drones," have dramatically captured the American public's attention (Horgan, 2013), primarily from the daily news and pundits' commentaries. Many mapping professionals see them as groundbreaking technology as they are inexpensive tools that can be easily deployed for on-demand data collection (Salmon, 2013). Civilian law enforcement, weather forecasters, agricultural experts, emergency responders, and other service professionals extol their potential. Social scientists foresee them as a "precursor technology," driving widespread adoption of robotics in performing daily tasks that will radically reshape society (Singer, 2013). Yet, the public still voices apprehension. Some concerns relate to air safety, and many suspect that domestic UASs will violate personal privacy and landowner rights. This heightened uneasiness has postponed commercial UAS deployment within U.S. airspace, and has raised the potential of limiting their full effectiveness when deployed haphazardly in U.S. production agriculture.

The agricultural UAS offers potential for significant contributions to agriculture (Grassi, 2013); however, only in

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foreign airspace are UAS agricultural research and development (R&D) now conducted unimpeded. The U.S. retail market for commercial applications is essentially closed, although the R&D that targets the U.S. market is progressing at a rapid pace. Numerous companies are now supplying UAS platforms for agricultural applications across Australia, South America, Europe, and Asia. According to the largest trade group, the Association for Unmanned Vehicle Systems International (AUVSI), Japan has an estimated 10,000 UASs deployed for agricultural use; they do 90% of the aerial crop dusting (AUVSI, 2013b). A wide breadth of countries, ranging from Uruguay, Argentina, Brazil, to Australia are also using UASs in agriculture to track cattle, survey crop health, detect harvest readiness, and as a tool for surveying the damage from drought, flooding, weeds, and pests (Green, 2013).

One such UAS making inroads in specialty-crop agriculture is the Yamaha RMax helicopter, having a size similar to a motorcycle. It has a 28-kg load capacity, with a practical visual operating range of up to 400 m. Thus, it is limited in its range and capacity to small fields. It was first introduced in Japan as an agricultural UAS, developed from Japanese government R&D funding extending back to the 1980s. Dealerships are now opening in Australia. The liquid sprayer has two 8-L tanks, and the granular sprayer has two 13-L hoppers. It can spray cover 1.3 ha in 10 min. The manufacturer promotes a wide variety of agricultural uses that include spraying, seeding, remote sensing for precision agriculture, frost mitigation, and variable rate dispersal. In Japan, where smaller fields predominate, RMax helicopters are used primarily for seeding and spraying rice (Yamaha, 2011). Yamaha (2011) states that "the use of unmanned helicopters rapidly spread to other crops besides rice, including wheat, oats and soybean in 1992, lotus root in 1993, daikon radish in 1994, and chestnut groves in 1995."

Industry groups foresee the economic potential of the UAS to be considerable; the Association for Unmanned Vehicle Systems International estimates the U.S. economy loses $10 billion for every year UAS production sales are delayed (AUVSI, 2013b). The AUVSI suggests that U.S. agricultural and law-enforcement will drive UAS applications, with 80% of use in the first 10 years within agriculture (AUVSI, 2013b). There are assertions that flying a UAS is only a fraction of the cost of manned aircraft (Povich, 2012), and for many operations, it is much faster. Remote sensing by an autonomous UAS on a 1000-ha field can provide mapping at 2-cm resolution in 45 min, a job that if flown traditionally would require hours, if not days due to scheduling (senseFly Ltd, 2014; Griekspoor, 2013). UASs are foreseen as supplying easy documentation of land conditions that facilitates crop insurance claims (Green, 2013).

A UAS capable of handling many agricultural applications can be purchased for $9000 (Green, 2013). Producers or commercial consultants will likely spend $30,000 to $80,000 for their UASs (AUVSI, 2013b) and some manufacturers will require lease-only arrangements along with stringent operator training (Yamaha, 2011). International trade-in-arms agreements now place monumental restrictions on the export, import, and ownership of high-payload capability UASs, as many are capable of militarization (Yamaha, 2011).

The Federal Aviation Administration (FAA) is the sole governmental agency entrusted with civil use of U.S. airspace, and it is primarily focused on public safety, not privacy issues. Under current FAA rules that address the civil use of a UAS, only a model aircraft (i.e., unmanned), or an aircraft being developed as a model aircraft, can be flown (FAA, 2013a). Strict restraints on hobby operations of UASs apply, particularly prohibiting their commercial use (Appendix A). The Academy of Model Aeronautics has established a Safety Code. FAA rules on hobby UASs flights align with this code (AMA, 2014). Its members must follow the Safety Code to maintain their liability insurance coverage during UAS operation.

The FAA Modernization Act of 2012 (PL 112-95) mandates that the Federal Aviation Administration (FAA) safely integrate commercial UASs into American airspace by September 2015. Domestic integration of UASs raises a number of complex issues, privacy and safety in particular (Dolan and Thompson, 2013; Bennett, 2012; Elias, 2012).

Objectives

There are four objectives of this study. It will:

1. Identify why policy debate regarding the UAS has emerged recently and discuss concerns regarding the domestic integration of the UAS.
2. Analyze the impact of the UAS legislation that has been introduced and passed on agriculture.
3. Suggest policy options for the successful integration of UAS into commercial use in the U.S.; and
4. Describe the factors influencing UAS policy decisions.

Procedure

A description of the emergence of controversy in the U.S. concerning the domestic use of UASs was obtained from a variety of sources. Given that policy discussion is ongoing and rapidly changing, articles in newspapers and newsmagazines were examined regarding the domestic use of UASs in the U.S. in addition to government documents and academic commentary.

The second objective of the study is to ascertain the impact on agriculture of the various policies under consideration involving UASs. Legislation introduced by the U.S. Congress since 2012 was reviewed. However, most of the UAS restricting policies under consideration are at the state level. The following procedure was used to categorize the bills introduced in state legislatures. First, organizations that track policy of interest to state and local government officials were consulted (National Conference of State Legislatures, Stateline.org, *Governing Magazine*) as were two entities that specifically monitor state UAS legislation in the U.S., DroneJournalism.org and the American Civil Liberties Union (ACLU). From these websites, a list of the states could be compiled that considered UAS bills. Since all proposed legislation is available on each state legislature's website, each bill introduced was available for analysis. Each bill was categorized into one of two levels based on its expected impact on agriculture. In states where no UAS law was adopted and there were multiple bills introduced, the most restrictive was coded for the state. In the states that have adopted legislation, the UAS law was coded. Bills that offered incentives to attract the UAS industry, sent issues relating to UASs for study, or proposed regulation that affected only law enforcement were classified as having little or no impact on agriculture. States with bills that limit civilian use of a UAS were categorized as containing policy that is a concern for agricultural interests.

The third objective of this paper is to suggest policies that would facilitate the implementation of UASs into agriculture. These suggestions are based on the commentary from policy and legal scholars and historians who specialize in technological adoption.

This project's fourth objective is to describe the factors shaping policy decisions regarding UASs. For this part, the economic impact, size, and lobbying activity of the major UAS interest groups were analyzed. Estimates of the economic impact of UAS integration were obtained from the AUVSI, the industry's largest trade group, and the Teal Group (2012), an aerospace and defense industry consulting firm. Lobbying information was garnered from reports of state legislatures and from projections from an analyst