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Flyover: The Potential Impact of Agroterrorism and Bioterrorism within Agricultural Aerial Application Operations

Notions of agroterrorism and bioterrorism as methods of control to deplete infrastructure have been present since the beginning of known civilization.[1] However, these threats are rarely conceived by the populous. With advances in technology, consumers in the agricultural market seldom understand the logistics of food and commodity production and how the effects of even a small-scale attack could impact the distribution, sale, and need for these products.[2] Another concern is the lack of social awareness toward quantifiable risks associated with the ongoing threat of terrorist activities. As such, understanding all aspects of agroterrorism and bioterrorism, specifically with regard to agricultural aerial application operations, is crucial.

Since the attacks of September 11, 2001, security measures and protocols have increased,[3] yet there is little reassurance or absolute safety. The use of aircraft to effectively deliver a large-scale attack has been proven to be a viable resource for terrorist activities due to the magnitude of destruction these vehicles can generate.[4] Several government, state, and industry-specific groups within the United States have targeted terrorist activity with regard to aviation. However, agricultural aviation differs from the general operational guidelines representative of other facets of commercial aviation. These differences make them especially susceptible to the intentional misuse of chemicals, equipment, and assets necessary to accomplish the goal of aerial application.

The aerial application industry — whose importance is unparalleled — ensures our food is free of pests and deliverable to the global market. The industry works day-to-day to provide a service and, without it, a component of the world population would succumb to consequences, such as disease and famine. The industry, however, can be difficult to regulate due to the lack of supervision from overworked and understaffed agencies.[5] Nonetheless, these agencies are responsible for providing protection from the ongoing threat of terrorist activity. For this reason, it is imperative to study, implement, and evaluate procedural guidelines and protocols to ensure the security of aircraft, chemicals, pilots, and operators.

History of Aerial Application

The first well-documented use of aircraft to control an agricultural pest in the United States occurred in 1921.[6] An article by C.R. Neille and J.L. Houser in the March 1922 issue of *The National Geographic Magazine*[7] described how lead arsenate dust was spread on catalpa trees near the Ohio Agricultural Experiment Station by being poured through a hole in the deck of a Curtis JN6 (Jenny) aircraft's observation cockpit.[8] From this humble beginning, aircrafts have had a role in the production of agricultural crops.[9]

As time progressed, the use of chemical dispersion by air became a necessity for the wellness of troops at war[10] who were exposed to diseases passed on by arthropod vectors. Beginning in World War II, aerial application of pesticides by the military effectively controlled vector and nuisance pest populations in a variety of environments.[11] During the Vietnam conflict, a mixture of 2,4,5-T and 2,4-D (Agent Orange)[12] became the preferred herbicide and defoliant to effectually expose enemy regimes to the U.S. military.[13] The product was very effective via aerial application; however, the long-term effects of exposure are still present in those who came in contact with the product — proving the lethality of the misuse of chemical dispersion by air.[14]

Today, aerial application has evolved into an extremely viable method of controlling pest populations. The industry has evolved from the low-powered, low-capacity aircraft of the early to mid-20th century into aircraft with much more capability.[15] Aerial application accounts for up to one-fourth of the delivery of crop production products in American agriculture.[16] Farmers value the use of aircraft because they can cover vast amounts of area quickly, without disturbing the soil or the growing crops. "Aircraft can glide over the crops at up to 140 miles per hour," which is important as some pests can cause serious damage in less than 24 hours.[17] Many companies have worked to develop high efficiency aircraft, including not only fixed-wing, but also rotary-wing platforms. Some newer aircraft are capable of carrying 800 gallons of product and can weigh as much as 16,000 lbs.[18] This makes them a very useful source for chemical dispersion, but incidentally, it also makes them a viable tool for terrorist activity.

Pilot Certification and Licensure in the U.S.

The certification of pilots in the

U.S. is governed by the Federal Aviation Administration (FAA), and the requirements to receive a certificate have different degrees of experiential and practical experience to meet minimum certification guidelines for a specific rating.[19] To perform any flight operations requiring the pilot to hold-out services to the public, he or she must meet the minimum standards to obtain a commercial pilot certificate.[20]

Certain applications require further levels of certification because of degrees of specificity, perceived operational dangers, or limitations. The Florida Department of Agriculture and Consumer Services (FDACS) is the state regulatory body that outlines registration and record-keeping requirements for aerial applicators.[21] State requirements vary; however, some states have quasi-reciprocal agreements that allow nonresident licensed applicators to work under someone who is currently licensed in the given state.[22] Most often, these reciprocal agreements require the licensure candidate to complete all the necessary requirements beyond written examinations.[23] The process to become a licensed aerial applicator is stringent and requires a great deal of effort and monetary output from the applicant; it provides an awareness of aviation security and how operators who may utilize noxious chemicals or products need to be specifically trained to identify and mitigate the improper use of assets.

Agricultural Aviation and Security

Agriculture and the food industry are very important to the social, economic, and arguably, the political stability of the United States. Although farming employs less than two percent of the country's workforce, 16 percent of the workforce is involved in the food and fiber sector that ranges from farmers and input suppliers to processors, shippers, grocers, and restaurateurs.[24] In 2002, the food and fiber sector contributed $1.2 trillion, or 11 percent to the gross domestic product (GDP), even though the farm sector itself contributed less than one percent.[25] Gross farm sales exceeded $200 billion and are relatively concentrated throughout the Midwest, parts of the East Coast, and California.[26] Production is split nearly evenly between crops and livestock.[27]

With the great responsibility of agricultural production comes the protection of those crops by chemical means, much of which is done with assistance of aviation. However, the same qualities that make agricultural aviation such a viable tool also make it a viable threat. Agricultural infrastructure remains a top target for potential terrorist attacks. The U.S. Office of Technology Assessment (OTA) has estimated an attack with less than 100 kilograms of aerosolized anthrax spores could cause as many as 3 million casualties — lethality equivalent to that of a thermonuclear weapon.[28] Thus, the responsibility of agricultural aviation is one of epic proportions. Agricultural aviation plays a compelling role in the prevention of terrorism due to the significant likelihood agricultural aircraft could be used for terrorism in an agroterrorism or bioterrorism event.

Agroterrorism and Bioterrorism

Agroterrorism is a subset of the more general issues of terrorism and bioterrorism. People more generally associate bioterrorism with outbreaks of human illness (such as from anthrax or smallpox) rather than diseases first affecting animals or plants.[29] For centuries, attacks of biological warfare have ranged from the purposeful infection of smallpox in native peoples to the more current issues today with anthrax and other pathogens that may cause widespread losses to human and animal life.[30]

Agroterrorism has been a threat tactic since the beginning of civilization.[31] The food source, being one of the most important requirements for sustaining human life, has been a viable target for malicious attacks on civilizations. When a food source is taken from a civilization, the people will revert back to an anarchical state as defined by Maslow.[32] This defines how we, as humans, will react to the deficit of certain stimuli within our environment. Physiological needs are among the first order, and are, therefore, the most important tool for survival.[33] The Roman Empire capitalized on this natural response with the intentional salting and burning of fields in an attempt to take over their adversaries — a historically, well-defined use of agroterrorism.[34]

More recently, "[a]t least nine countries had documented agricultural bioweapons programs during some part of the 20th century (Canada, France, Germany, Iraq, Japan, South Africa, United Kingdom, United States, and the former USSR)," and "[f]our other countries are believed to have or have had agricultural bioweapons programs (Egypt, North Korea, [Zimbabwe], and Syria)."[35] During World War I, the Germans used the infectious disease glanders to decimate enemy horses and mules.[36] The Japanese had a special division during World War II, known as Unit 731, that was created to develop biological weapons, including "plague, anthrax, cholera and a dozen other pathogens."[37] Unit 731 "conducted research by experimenting on humans and by 'field testing' plague bombs by dropping them on Chinese cities to see whether they could start plague outbreaks….[And t]hey could."[38] The Soviet Union also used biological weapons against its enemy's infrastructure and agricultural systems.[39]

More locally, agroterrorism was listed as the source for the Oklahoma City bombing in 1995. On April 19, the Alfred P. Murrah Federal Building in downtown Oklahoma City was considered to be the most destructive act of terrorism on American soil until September 11, 2001,[40] the estimated damage of which was $652 million, with a total of 168 people killed.[41] A bomb consisting of 108 .50 lbs. bags of ammonium nitrate fertilizer and three 55-gallon drums of nitromethane[42] was the source of the destruction, and these products are both readily available and easily obtained in commercial markets, thereby making them a popular tool for terrorist attacks.

The Oklahoma City bombing was a clear example of how agricultural products and chemicals can be used to create incendiary devices. The concern for agricultural aviation is that an aircraft could be used to deliver a similar strike against the nation. For

instance, the Air Tractor 802A, made by Air Tractor, Inc., has an operating weight of 16,000 lbs., with an empty weight of 6,751 lbs.[43] This allows the aircraft to carry over a 9,000-lb. load without accounting for fuel. The hopper, or spray tank, on this aircraft has a holding capacity of 800 U.S. gallons, with a fuel capacity of 254 U.S. gallons.[44] Given its size and carrying capacity, this type of aircraft could be used to create an incident resulting in even greater destruction than the Oklahoma City bombing.

Indeed, our current agriculture and food sectors have features that make them vulnerable to such terrorist attacks. "Livestock are frequently concentrated in confined locations," making larger scale contamination easier and more likely.[45] In addition, the high concentration of our livestock industry and centralized nature of our food-processing industry[46] prove problematic. Chemicals and infectious pathogens can be intentionally added at various points along the farm-to-table food continuum.[47] At the state level, Florida's geographic location and extensive coastline increase the opportunity for terrorist accessibility.[48] "Food and water are quite satisfactory vectors for pathogens causing both morbidity and mortality in target populations that are confined by geographic, industrial, or societal isolation."[49]

Additionally, "production is geographically disbursed in unsecured environments," which makes it difficult to prevent infiltration by intruders.[50] Also, "[p]est and disease outbreaks," or even just the rumor of such outbreaks, "can quickly halt economically important exports."[51] The number of biological agents that are deadly or dangerous to animals is substantially higher than those that pose a threat to humans.[52] Subsequently, a bioterrorist attack on our agricultural system "offers a low-tech mechanism for achieving human deaths."[53]

In the 1990s, several attacks occurred in Wisconsin. In 1996, "a cow carcass was intentionally contaminated with chlordane," a substance now banned in the United States, "and sent to an animal rendering plant where it was added to the feed."[54] In this attack, "4,000 tons of potentially contaminated animal feed was sent to 4,000 farms in four states" causing a multimillion-dollar product recall of dairy products and "a $250 million loss to the feed company."[55] Clearly, the economic consequences of an attack on the U.S. could be devastating. "The fiscal downstream effect of a deliberate act of sabotage would be multidimensional, reverberating through other sectors of the economy and ultimately impacting the consumer."[56] Initially, the U.S. system would feel the loss of production, including the cost to destroy the infected livestock or products as well as the cost to prevent further spread by deploying pesticides and veterinary services.[57] Shortly thereafter, the export market would be lost as other countries "place restrictions on U.S. products to prevent possibilities of the disease spreading."[58] Agricultural dependent industries would then feel the "multiplier effect" as a result of the decreased sales.[59] Finally, "the govern-

ment could bear significant costs" in righting the ship.[60]

Biological attacks are a relevant cause for concern. From an aerial application standpoint, chemicals or biological agents could easily be disseminated from an aircraft causing widespread damage to life and property. This concern is not only dusting the food we eat, but the towns we live in, the schools our children attend, and the hospitals our wounded and ill receive care.

Security Countermeasures

Aviation security has been a concern among operators for many years. Generally, airport environments are susceptible to intrusion because of the expansive area they cover and the probability of breaches to perimeter security. Many facilities do not have the infrastructure to consistently monitor areas that may be vulnerable to malicious activity. The FAA, in cooperation with agencies, such as the Transportation Security Administration (TSA), Aircraft Owners and Pilots Association (AOPA), and National Agricultural Aviation Association (NAAA), have worked to promote safety campaigns to increase awareness for airport owners/operators on best practices in preventing unlawful activity.[61] Airports exhibit high variability with infrastructure, size, funding, and staff. Some airports have specialized operations, such as those used by many aerial applicators; these airports may be private or nonaccessible to other general aviation traffic. They may also be in more rural environments, due to the nature of the operation and accessibility to areas where aerial application services may be most utilized. Best practices should be used effectively and in combination with each other in order to best inhibit or prevent the threat of malicious activity. NAAA is an advocacy group that works closely with state and government agencies to promote discussion and create viable solutions for issues that affect the aerial application industry. They have campaigned to increase awareness and security through education and the creation of policy that effectively mitigates risk, but does not impede or become burdensome to the industry. Proactive measures may be introduced in a number of ways. For instance, the NAAA gained approval from the FAA to allow hidden ignition switches without having to go through the extensive paperwork process associated with FAA form 337.[62]

Options for security are not mandated based on the level of infrastructure or assets an area needs to safeguard; security assessment often relies on the owner/operator of a given facility, which may place many agricultural operators in a higher-than-normal risk category. For example, factors such as storage and maintenance of hazardous chemicals, require a high level of diligence. Operational areas in rural environments may also allow unique opportunities for threat, so it is of paramount importance for operators to understand and effectively manage risk through the use of resources issued by the NAAA and FAA.

Safety Management Systems

The development of Safety Management Systems (SMS) has become a component of many aviation organizations. The FAA defines a SMS as "the formal, top-down business approach to managing risk, which includes a systemic approach to safety, including the necessary organizational structures, accountabilities, policies and procedures."[63] The design and implementation of a SMS may be organization specific and may require different protocols based on factors, such as size, number of pilots, number of aircraft, operational setting, special operational requirements, and security. SMS are internationally recognized by the Joint Planning and Development Office (JPDO), International Civil Aviation Organization (ICAO), and civil aviation authorities,[64] and are widely publicized by the National Business Aircraft Association (NBAA) in an effort to develop a standard for the safe and efficient operation of business aircraft. The core elements of SMS have led to the evolution of industry standards outside of aviation to include the management of critical areas, such as "quality, occupational safety and health, security, [and] environmental."[65]

SMS may also be a viable method for the development of operational safety protocols, assessment, evaluation, and implementation of new policies and procedures. The shared responsibilities of the FAA and certificate holders include: a structured means of safety risk management decisionmaking; a means of demonstrating safety management capability before system failures occur; increased confidence in risk controls though structured safety assurance processes; an effective interface for knowledge sharing between regulator and certificate holder; and a safety promotion framework to support a sound safety culture.[66]

The organizational knowledge and synergy produced by an SMS have proven to increase awareness and promote a positive safety culture. However, to be effective, differences must be assessed between varying types of commercial applications. For example, aerial applicators are bound by operational protocols that do not necessarily align with those of air carrier operators, and they have shown some resistance to the implementation of more regulation in developing SMS. In a recent National Agricultural Aircraft Association board meeting, members were advised of a workaround to modify fully developed SMS to make them more usable for the agricultural aviation community.[67] This would allow operators to better hone requirements and policies specific to agricultural aviation.

In an effort to contribute to overall safety in the industry, the National Agricultural Aviation Research & Education Committee (NAAREF) implemented the Professional Aerial Applicators' Support System (PAASS). The overall goal of the PAASS initiative was to implement a higher level of safety through education instead of regulation. The program has proven successful in augmenting knowledge in critical Aeronautical Decision Making (ADM) skills and minimizing drift incidents and accidents.[68] PAASS has also become influential in the awareness campaign to educate aerial applicators of the ongoing threats associated with terrorism.

Conclusion

The aviation industry, as a whole, is comprised of a fairly small percentage of professionals; this is conducive for keeping track of current trends and issues affecting their industry. With regard to agroterrorism and bioterrorism, the industry has a high level of intrinsic knowledge about issues that stem from experience, resources, and inter-employee contact. Aerial applicators are very insightful about new trends and technology in their industry; they consistently look for resources and information that help them perform with a higher level of efficiency and safety. These qualities make them very receptive to the implementation of new resources relating to industry issues.

The aerial application industry requires a special type of individual, one who is motivated to work individually and one who is educated, by experience, to implement the proper procedures in regard to safety, security, and chemical drift. From the areas of security, certification, and regulation enforcement, the FAA provides a valuable service. However, it may require more specialized workgroups and time to ensure a proper level of service to aerial applicators. At present, the framework prescribed to consistently implement and enforce new guidance to effectively promote efficiency and safety within the industry needs further review.[69]❑

[1] *See* Jeffrey K. Smart, *History of Chemical and Biological Warfare: An American Perspective,* Medical Aspects of Chemical and Biological Warfare 10-13 (1997) (describing the major biological and chemical events used to decimate enemy infrastructure throughout history dating back as far as 400 B.C.); *see also* Grant L. Morris, *A New Kind of War: Are We Prepared for Agroterrorism?* 8 (2007), *available at* http://www.dtic.mil/dtic/tr/fulltext/u2/a470894.pdf.

[2] *See* Dean Olson, *Agroterrorism,* FBI Law Enforcement Bulletin (Feb. 2012) ("Because most processed food travels to distribution centers within a matter of hours, a single case of chemical or biological adulteration could have significant latent ongoing effects...[and] any significant and continuing disruption in supply quickly will lead to severe shortages."); *see also* Jim Monke, *Agroterrorism: Threats and Preparedness*, Congressional Research Service 8-11 (Mar. 2007), *available at* http://www.fas.org/irp/crs/RL32521.pdf (describing the devastating result of a successful attack on the agricultural market).

[3] *See* Jason Villemez & Dalia Mortada, *9/11 to Now: Ways We Have Changed*, PBS Newshour (Sep. 14, 2011), http://www.pbs.org/newshour/rundown/2011/09/911-to-now-ways-we-have-changed.html.

[4] Alona E. Evans, *Aircraft Hijacking: What Is To Be Done?*, 66 The American J. International Law 819-20 (Oct. 1972), *available at* http://www.jstor.org/stable/2198513.

[5] U.S. General Accounting Office (GAO), *Aviation Safety: New Airlines Illustrate Long-Standing Problems in FAA's Inspection Program* (Oct. 1996), *available at* http://www.gao.gov/assets/230/223346.pdf.

[6] *See History of Agricultural Aviation*, NAAA (2013); Eldon W. Downs & George F. Lemmer, *Origins of Aerial Crop Dusting,* 39 Agricultural History 125-26 (Jul. 1965), *available at* http://www.jstor.org/stable/3740251.

[7] *See* C.R. Neille & J.L. Houser, *Fighting Insects*, The Nat. Geographic Mag. (Mar. 1922).

[8] T.W. Dean, *Aerial Application* 27 (1999), UF/IFAS, Coop. Exten. Pub., Gainesville; *see* Downs & Lemmer, *Origins of Aerial Crop Dusting,* Agricultural History at 125-26.

[9] Dean, *Aerial Application* at 12.

[10] M. Breidenbaugh & K. Haagsma, *The US Air Force Aerial Spray Unit: A History of Large Area Disease Vector Control Operations, WWII through Katrina*, U.S. Army Med. Dep. J. 54 (2008), *available at* http://cdm15290.contentdm.oclc.org/cdm/ref/collection/p15290coll3/id/624 (aerial application of chemicals "employed with excellent results to combat malaria in the South Pacific during World War II").

[11] *Id.*

[12] U.S. Dept. of Veterans Affairs, Facts About Herbicides, http://www.publichealth.va.gov/exposures/agentorange/basics.asp.

[13] Breidenbaugh & Haagsma, *The US Air Force Aerial Spray Unit: A History of Large Area Disease Vector Control Operations, WWII through Katrina*, U.S. Army Med. Dep. J. at n.15.

[14] *See* U.S. Dept. of Veterans Affairs, Veterans' Diseases Associated with Agent Orange, http://www.publichealth.va.gov/exposures/agentorange/conditions/index.asp.

[15] *See* Dean, *Aerial Application* at 27, n.12.

[16] NAAA, History of Agricultural Aviation (2013), http://www.agaviation.org/industryhistory.

[17] *Id.*

[18] Air Tractor, AT-802A Single-Engine Agricultural Aircraft (2016), https://airtractor.com/aircraft/at-802a/.

[19] *See* Federal Aviation Administration, Licenses & Regulations, http://www.faa.gov/licenses_certificates/.

[20] *See generally* 14 C.F.R. §61.123-.331 (West 2013). For example, §61.123 listed general requirements with regard to age, English proficiency, and approval from a flight instructor, 14 C.F.R. §61.123 (West 2013), while §§61.125, 61.127, 61.129 address the requirements for aeronautical knowledge, flight prophecy, and aeronautical experience, respectively.

[21] Florida Department of Agriculture and Consumer Services, Aircraft — Seed, Pesticides and Fertilizer (2013).

[22] States generally have formed reciprocal "blocs," recognizing certifications from partner states. For example, North Carolina has reciprocal agreements with Florida, Georgia, South Carolina, Virginia, and Mississippi depending on the type of certification. *See, e.g.*, North Carolina Department of Agriculture & Consumer Services, Reciprocity (2013), http://www.ncagr.gov/SPCAP/pesticides/Reciprocity.htm.

[23] *See id.*

[24] Monke, *Agroterrorism: Threats and Preparedness* at 5.

[25] *Id.*

[26] *Id.*

[27] *Id.*

[28] Gregory Koblentz, *Pathogens as Weapons: The International Security Implications of Biological Warfare*, 28 International Security 84-122 (2003-04).

[29] Monke, *Agroterrorism: Threats and Preparedness* at 5.

[30] *See* Smart, *History of Chemical and Biological Warfare: An American Perspective,* Medical Aspects of Chemical and Biological Warfare at n.2.

[31] *See id*. at 10-13.

[32] Janet A Simons, *et al*., *Maslow's Hierarchy of Needs*, Psychology: The Search for Understanding, *available at* http://chettourhorizonsforteaching.blogspot.com/2009/02/maslows-hierarchy-of-needs.html.

[33] *Id.*

[34] *See* R. T. Ridley, *To Be Taken with a Pinch of Salt: The Destruction of Carthage*, 81 Classical Philology 140 (Apr. 1986), *available at* http://www.jstor.org/stable/269786.

[35] Monke, *Agroterrorism: Threats and Preparedness* at 5.

[36] Charles Edward Stewart, Weapons of Mass Casualties and Terrorism Response Handbook 98 (2005); *see also* Monke, *Agroterrorism: Threats and Preparedness* at 5, n.9.

[37] Nicholas D. Kristof, *Unmasking Horror — A Special Report; Japan Confronting Gruesome War Atrocity*, NY Times, Mar. 17, 1995, *available at* http://www.nytimes.com/1995/03/17/world/unmasking-horror-a-special-report-japan-confronting-gruesome-war-atrocity.html.

[38] *Id.*

[39] *See generally* Jonathan B. Tucker, *Biological Weapons in the Former Soviet Union: An Interview With Dr. Kenneth Alibek*, The Nonproliferation Rev. 5 (1999), *available at* http://cns.miis.edu/npr/pdfs/alibek63.pdf ("[The] Soviet Union had employed a glanders biological weapon against the *mujahaddin* in remote locations in Afghanistan in 1982. Glanders, whose scientific name is *Pseudomonas mallei*, is lethal for horses and incapacitating for human beings."). *See also* Monke, *Agroterrorism: Threats and Preparedness* at 5, n.9 (stating the Soviets allegedly used glanders during their invasion and occupation of Afghanistan in the 1980s); Stewart, Weapons of Mass Casualties and Terrorism

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[41] FBI, *Terror Hits Home: The Oklahoma City Bombing* (2013).

[42] Joseph B. Treaster, *Terror in Oklahoma City: The Bomb; The Tools of a Terrorist: Everywhere for Anyone*, N.Y. TIMES, Apr. 20, 1995, *available at* http://www.nytimes.com/1995/04/20/us/terror-in-oklahoma-city-the-bomb-the-tools-of-a-terrorist-everywhere-for-anyone.html.

[43] Air Tractor, AT-802A Single Engine Agricultural Aircraft (2016), https://airtractor.com/aircraft/at-802a/.

[44] *Id.*

[45] Monke, *Agroterrorism: Threats and Preparedness* at 1. *See also* RAND, *Agroterrorism* ("Highly crowded rearing and breeding conditions mean an outbreak of a contagious disease would be very difficult to contain, especially if it is airborne, and could require the destruction of all exposed livestock.").

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[47] *Id.*

[48] Jodi L. Degraw, *Perceptions of Florida Beef Cattle Producers on Preparedness for An Agroterrorism Attack: A Thesis*, University of Florida (2005), *available at* http://etd.fcla.edu/UF/UFE0011863/degraw_j.pdf.

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[50] Monke, *Agroterrorism: Threats and Preparedness* at 1. *See also* Glenn R. Schmitt, *Agroterrorism — Why We're Not Ready: A Look at the Role of Law Enforcement*, SHERIFF MAGAZINE (2006), *available at* http://www.nij.gov/journals/257/Pages/agroterrorism.aspx (describing the agricultural system a "soft" target for terrorists because "[f]arms, ranches, and feedlots are open and generally unprotected").

[51] Monke, *Agroterrorism: Threats and Preparedness* at 1.

[52] *Id.* at 2.

[53] RAND, *Agroterrorism* at *2.

[54] *Id.*

[55] *Id.*

[56] *Id.* at *1.

[57] Monke, *Agroterrorism: Threats and Preparedness* at 6.

[58] *Id.*

[59] *Id.*

[60] *Id.*

[61] University of Minnesota Center for Transportation Studies, *Agricultural Aircraft Operations on Municipal Airports: A Guidebook for Municipal Airport Managers* (Aug. 2016), *available at* http://www.airtap.umn.edu/publications/factsheets/toolkit/documents/agriculturalaircraft.pdf.

[62] NAAA, Security Issues, http://www.agaviation.org/securitypolicy.

[63] FAA, Aviation Safety, Safety Management System (SMS), https://www.faa.gov/about/initiatives/sms.

[64] FAA, Safety Management System SMS Explained, http://www.faa.gov/about/initiatives/sms/explained/.

[65] *Id.*

[66] *Id.*

[67] Graham Lavender, *NAAA Hosts 2013 Spring Board Meeting*, AGAIRUPDATE.

[68] NAAA, Professional Aerial Applicators' Support System, http://www.agaviation.org/content/professional-aerial-applicators-support-system.

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