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U.S. Airspace Integration: Perspectives of the FAA UAS Test Site Program

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U.S. AIRSPACE INTEGRATION: PERSPECTIVES OF THE FAA UAS TEST SITE PROGRAM

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Marian Courtney

05/2015

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ABSTRACT

In an effort to integrate unmanned aircraft into the national airspace system, congress mandated action by the Federal Aviation Administration under the Federal Aviation Administration Modernization and Reform Act of 2012. It required the formation of six test sites that would conduct unmanned aircraft operations in an effort to assist the FAA in its task to form safety regulations regarding unmanned aircraft. The FAA has been heavily criticized for its slow movement and inability to meet deadlines. The purpose of this study is to gather perceptions of the FAA's unmanned aircraft systems test site program. Using a qualitative approach, interviews were conducted with some of the test sites to gain insight of the current status of the test site program after its first year. This study provides information on what otherwise is a very limited researched area, and discovers the complexity of the test site program including the advancements made and the difficult system in which it operates. As a result, themes emerged including lack of support from the FAA, confusion of test sites roles, and the uncertain future of the test site program.

CHAPTER I

INTRODUCTION

As advancements in technology make unmanned aircraft more accessible, their potential uses make them attractive in both the public and private sector. The Government Accountability Office (GAO) indicated the need for unmanned aircraft systems (UAS) development and integration in 2008, but no action was taken by the Federal Aviation Administration (FAA) (Government Accountability Office [GAO], 2008). In February of 2012 congress enacted the FAA Modernization and Reform Act of 2012, PL-112-95 (FMRA). In section 332 of this act, Congress mandated the FAA establish six test sites as part of the process to integrate unmanned aircraft into the national airspace system (NAS) by 2015 (United States, 2012). The six selected test sites were announced by the FAA on December 30, 2013 roughly one year prior from the time of this study.

Purpose of Study

The purpose of this study is to gather perceptions of the FAA's six UAS test sites used to help unmanned aircraft integrate into the NAS. The FAA test sites were developed as research sites to contribute to the development of future regulations set forth by the FAA. Gaining the perceptions of the test sites and the FAA will provide useful data to understand the lessons learned as a result.

Research Questions

1. What research has the FAA test sites conducted to assist in FAA regulations?
2. One year after the announcement of the test sites, how influential is the FAA test site program?
3. What issues confront the FAA as it administers the test site program?
4. What does the future entail for the FAA test site program?

Background

This review provides background information regarding unmanned aircraft and the current structure of operating unmanned aircraft in the National Airspace System.

Unmanned aircraft are often referenced under many different names including unmanned aerial vehicle (UAV), unmanned aircraft system (UAS) and remotely piloted aircraft (RPA). A common misconception is that unmanned aircraft are drones. The term "drone" is associated with the functionality of a cruise missile, pre-programmed, and can lack real time control and communication (Austin, 2010). An unmanned aircraft is a reusable aircraft in which the pilot is located outside the aircraft. Unmanned aircraft however, did claim their fame as drones first. Cruise missiles and aerial torpedoes were used in military warfare for strike and reconnaissance. In 1917 Charles Kettering invented the "Kettering Bug", a flying bomb thought to be the first modern unmanned aircraft (Keane & Carr, 2013).

Fast forward to present day, unmanned aircraft are widely used in the United States military conducting similar operations of manned aircraft including strike, intelligence, surveillance, reconnaissance, search and rescue, refueling and air combat. A huge military

advantage to unmanned aircraft is the safety of pilots who operate from outside the cockpit, saving pilots lives who may otherwise be killed in air combat. Another advantage is the ability of pilots to operate for longer periods of time than an onboard pilot could safely operate (DOT, 2013; GAO, 2008).

Military uses of unmanned aircraft have increased the interest of non-military applications. Disaster and emergency aid can be improved through the use of unmanned aircraft. Communications that may otherwise be overloaded or obstructed by terrain can be fixed with the use of unmanned aircraft (GAO, 2008). This would be beneficial during emergencies such as natural disasters or other times communications are inhibited.

U.S. federal agencies have benefited using unmanned aircraft. The National Oceanic and Atmospheric Administration (NOAA) Unmanned Aircraft Systems Program uses unmanned aircraft to collect high impact weather, polar, ozone and marine information data monitoring (National Oceanic and Atmospheric Administration, n.d.). Since 2008. Customs and Border Protection (CBP) has been using Predator B unmanned aircraft for law enforcement and homeland security in difficult-to-access areas and high-risk missions. CBP uses the MQ-9 Predator B also referred to as the Reaper, and a maritime variant called the Guardian to stream high quality video for emergency and illegal cross-border activity operations (Customs and Border Protection, 2014). NASA has also shown successful uses of unmanned aircraft. They used two Global Hawks for research of polar ice melt monitoring and hurricane development off the coast of the United States (GAO, 2008).

Commercial Uses

Unmanned aircraft can be used in a variety of ways which makes them attractive to many different industries (Castelvecchi, 2010). Regulations supportive to commercial use of unmanned aircraft would allow companies to take advantage of the smaller and cheaper aircraft.

Unmanned aircraft have already made their presence on farms in supporting agriculture. Receiving imagery of farms via satellite can take weeks, and the expense of manned aircraft makes unmanned aircraft that much more attractive. Japanese and Canadian farmers have been using unmanned aircraft on farms for years, but current regulations in the United States prevent farmers from receiving the same commercial benefits (Dillow, 2014). The American Farm Bureau Federation is currently lobbying for regulations that would allow for both day and night operations beyond line of sight (Morgan, 2015). Farmers would like the ability to treat crops during optimal hours, which at times, is after sunset. To combat deforestation, BioCarbon Engineering, a UK based company, has developed a system allowing an unmanned aircraft to 3D map terrain, then plant biodegradable seed pods (Jozuka, 2015). In addition to agricultural abilities, unmanned aircraft are also being used for wildlife research.

Using unmanned aircraft for wildlife research allows for tracking animals and monitoring their behavior while reducing disturbances to animals (Watts et al., 2010). The Wildlife Conservation Society started the Wildlife Conservation UAV Challenge (wcUAVc) in which the goal is to design, build and fly an unmanned aircraft to assist the effort against poaching and wildlife trafficking (Kashmire World Foundation, 2015). In

addition to tracking wildlife, unmanned aircraft can also track illegal poachers to help protect endangered species. In Namibia, the World Wildlife Fund has begun assisting the training of park rangers on how to fly unmanned aircraft (CBS Interactive Inc., 2014).

More uses for unmanned aircraft continue to emerge, and it seems their capabilities are only limited by one's imagination. A more innovative use, designed by a Dutch graduate student, is an unmanned aircraft that can deliver an AED (automated external defibrillator). The system uses its speakers to communicate instructions to those nearby, and can arrive within 1 minute to the scene of a cardiac emergency (Husten, 2014). Another lifesaving design is being tested off the coasts of Chile, acting like a lifeguard, the unmanned aircraft can deliver floatation devices to struggling swimmers at sea, before actual human help arrives (McDonald, 2015).

Amazon announced its interest in using unmanned aircraft in December 2013, as Prime Air, a 30-minute package delivery service (CBS Interactive Inc., 2013). The announcement was covered heavily by the media and brought more attention to the lack of current FAA regulations concerning unmanned aircraft. Amazon has since criticized the FAA for its slow progress. In a letter dated April 8, 2015, the FAA granted Amazon an exemption allowing operations of unmanned aircraft, under certain limitations. Amongst the list of 28 limitations, restrictions included a 400 feet above ground level (AGL) ceiling, an 87 knot speed restriction, operations within visual line of sight (VLOS), and operated by a pilot with the additional assistance of a visual observer (VO).

Aircraft Classification

Many categories of unmanned aircraft have emerged as a result of the variety of technology used in design. At this time, there is no formal classification of unmanned aircraft. Many different organizations have come up with their own based on organizational needs. A generic classification system based on weight was comprised by the Department of Transportation for the U.S. Air Force in their technical report Unmanned Aircraft System (UAS) Service Demand 2015-2035 (2013). The classifications are as follows:

Table 1: Unmanned Aircraft Classifications (based on weight)

NANO	less than 1 lb
MICRO	more than 1lb-4.5lbs
SMALL UAS	more than 4.5lbs to 55lbs
ULTRALIGHT	more than 55lbs to 254lbs
LIGHT SPORT AIRCRAFT	more than 254lbs to 1,320lbs
SMALL AIRCRAFT	more than 1,320lbs to 12,500lbs
MEDIUM AIRCRAFT	more than 12,500lbs to 41,000lbs
LARGE AIRCRAFT	more than 41,000lbs to 300,000lbs

UAS Demand/Growth

Teal Groups 2014 market study estimates that UAS spending worldwide will double in the next ten years as seen in Figure 1. Due to the slow progress, and only very recent development of action by the FAA for UAS access to NAS, some U.S. companies have taken their businesses internationally, and as a result bringing the economic

advantages away from the U.S.. Companies who have seen the advantage of unmanned aircraft have continuously made requests to the FAA regarding regulations.

Figure 1: UAS Forecast (DOT, 2013)

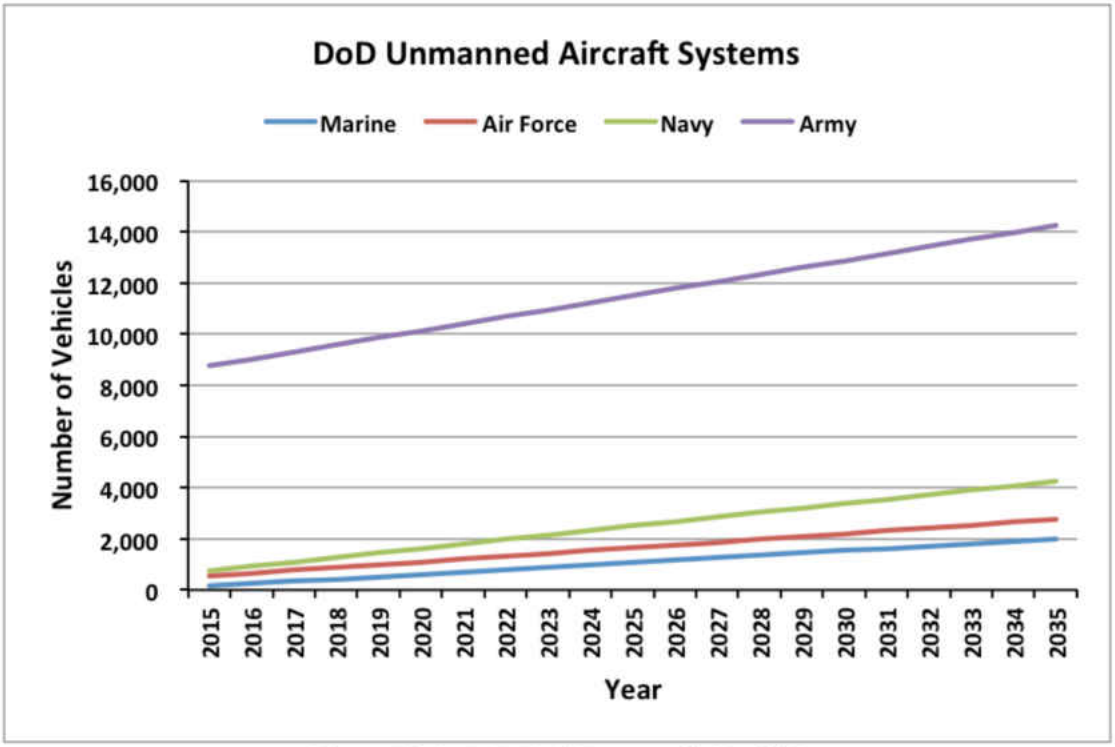

Figure ES-1 - DoD UAS Forecast 2015 - 2035

FAA Regulations

On June 10, 2014 the FAA released a statement permitting the first commercial flight of an unmanned aircraft (Federal Aviation Administration, 2014a). It allowed BP and AeroVironment to operate a small hand-launched unmanned aircraft for pipeline monitoring.

One of the current ways to operate an unmanned aircraft in the NAS, is through the use of a Certificate of Waivor or Authorization (COA) must be issued by the FAA. The

goal of the COA is to define operating limitations for an unmanned aircraft that ensures the same level of safety as manned aircraft (Federal Aviation Administration, 2015a). A COA can only be obtained by public agencies and are often obtained by law enforcement agencies and universities. The FAA responds to a COA application within 60 days, which means lawfully obtaining access to the NAS for unmanned aircraft can be a lengthy process.

UAS Test Sites

In compliance with the FAA Modernization and Reform Act of 2012 (FMRA), the FAA was tasked to create UAS test sites to assist in the process of developing certification, flight standards, and air traffic requirements for civil unmanned aircraft systems. Included in the bill, were the following guidelines for selecting the test ranges:

> (A) take into consideration geographic and climatic diversity;
>
> (B) take into consideration the location of ground infrastructure and research needs
>
> (C) consult with the National Aeronautics and Space Administration and the Department of Defense. (United States, 2012).

On March 9, 2012 the FAA published Request for Comments in the Federal Register [Docket No. FAA-2012-0252] and hosted two public webinars the following month (Federal Aviation Administration [FAA], 2013b). Concluding the 10 month selection process and reviewing 25 proposals, the FAA chose the following six test sites on December 30th, 2013: University of Alaska, State of Nevada, New York's Griffiss International Airport, North Dakota Department of Commerce, Texas A&M University – Corpus Christi, and Virginia Polytechnic Institute and State University (Virginia Tech). As

stated by the FAA Administrator, Michael P. Huerta, the six test sites were chosen based on their variety in weather, topographical and airspace conditions as well as their support of ground infrastructure and research programs (FAA, 2013b). Supplemental to Huerta's announcement of the test sites, Fact Sheet- FAA UAS Test Site Program was also released on December 30th, 2013. This document included more information and stated the benefits of each selected test site as seen below.

University of Alaska - The University of Alaska proposal contained a diverse set of test site range locations in seven climatic zones as well as geographic diversity with test site range locations in Hawaii and Oregon. The research plan includes the development of a set of standards for unmanned aircraft categories, state monitoring and navigation. Alaska also plans to work on safety standards for UAS operations.

State of Nevada - Nevada's project objectives concentrate on UAS standards and operations as well as operator standards and certification requirements. The applicant's research will also include a concentrated look at how air traffic control procedures will evolve with the introduction of UAS into the civil environment and how these aircraft will be integrated with Next Generation Air Transportation System (NextGen). Nevada's selection contributes to geographic and climatic diversity.

New York's Griffiss International Airport - Griffiss International plans to work on developing test and evaluation as well as verification and validation processes under FAA safety oversight. The applicant also plans to focus its research on sense and avoid capabilities for UAS and its sites will aid in researching the complexities of integrating UAS into the congested, northeast airspace.

North Dakota Department of Commerce - North Dakota plans to develop UAS airworthiness essential data and validate high reliability link technology. This applicant will also conduct human factors research. North Dakota's application was the only one to offer a test range in the Temperate (continental) climate zone and included a variety of different airspace which will benefit multiple users.

Texas A&M University – Corpus Christi - Texas A&M plans to develop system safety requirements for UAS vehicles and operations with a goal of protocols and procedures for airworthiness testing. The selection of Texas A&M contributes to geographic and climactic diversity.

Virginia Polytechnic Institute and State University (Virginia Tech) - Virginia Tech plans to conduct UAS failure mode testing and identify and evaluate operational and technical risks areas. This proposal includes test site range locations in both Virginia and New Jersey. (FAA, 2013b)

CHAPTER II

METHODOLOGY

Justification for Research

As a new industry, an increased demand for unmanned aircraft use has left a gap in research concerning unmanned aircraft. Without current and respected research, it is generally accepted that regulation and policy makers have no maturation to support the making of new policies. In order to help fill this gap assisting in regulation creation, the FAA set up six UAS test sites as noted earlier. The researcher was only able to find a very limited selection of studies concerning these test sites, all of which have been conducted by the Government Accountability Office (GAO). This lack of knowledge contributes to the need for additional research in the field.

Qualitative Approach

For this research design, it was determined that a qualitative analytical approach would be most effective. Qualitative research allows for exploring individuals or groups to gain insight on the cause of a problem (Creswell, 2009). Both facts and meaning can be obtained from a qualitative interview which allows for more in-depth information to be obtained (Kvale, 1996). More specifically, the qualitative approach can be a case study. According to Stake (1995) case studies explore a program, event, activity, process, or individuals.

A social constructivist worldview was used for this study. Social constructivism allows for questions to be broad and general so that the participants, the interviewees, can share their views. The social constructivist worldview recognizes the researcher is part of the research because their own interpretations of the research comes from their personal, cultural, and historical experiences (Creswell, 2009).

The methodology used for this qualitative case study utilized open-ended questions through phone interviews and analysis of documents. Selection of the individuals to be interviewed was done by previewing the employees of each test site, and interviewing whoever held the highest position and was directly involved with the test site. The highest position was desirable as it was expected the person holding that position would be the most informed of all aspects related to the test site.

IRB/ Protection of Human Subjects

Approval from the University of North Dakota's Institutional Review Board (IRB) was received on February 13th, 2015. A letter of intent was sent to each test site requesting participation. After approval by the IRB, the research was conducted.

Interview Questions

After the initial contact of participants and their confirmed involvement, a phone interview was scheduled for an hour and a half. At the start of each telephone interview, the researcher explained the purpose of study to the participants and provided pertinent background information. Appendix A shows a list of the guiding questions used for the interviews.

Possible Ethical Issues and Bias'

One ethical issue the researcher has noted is the possibility of conflicting interests. It seems apparent that some test sites may have withheld information from the researcher. This is defended by the hesitation the researcher sensed from interviewees in answering certain questions, and denial to provide certain information.

Analysis

To analyze the results, a categorization process was used to organize all collected data. This system included a robust organization of material including information from interviews, government documents, press releases, and test site websites. After categorization was complete, subcategories were made and coding was used to determine the themes discussed.

CHAPTER III

RESULTS AND EVALUATION

Lack of Support for Test Sites

Only three of the six test sites committed to being interviewed, further information was obtained from test site websites, news articles, and FAA and government documents. To ensure anonymity of each test site individual who graciously participated in an interview, all sources that are not publicly available have been omitted. For organizational purposes, test site spokesman that were interviewed will be referred to without any identifiable information.

A Freedom of Information Act (FOIA) request was made to the FAA on February 3rd, 2015 and after no reply, another unanswered request was made on March 30th, 2015. Requests were made to retain the applications submitted to the FAA from organizations applying to become a UAS test site range.

Variety of Funding

One of the requirements for being designated an FAA test site, was the ability to be self-funded. No FAA funding would be given to the test sites. To begin, many test sites were initially funded by those who sponsored their application, and some continue to be funded this way. In addition to the sponsored funding, interviewed test sites are also receiving income by providing services to the private sector. Test sites have taken the

opportunity to apply and receive both federal and state grants. Eventually, the test sites interviewed plan to be supported by the industry and private sector businesses.

FAA Support

The test sites originally believed the FAA had their best interest in mind, but that has not been shown through the distribution of Section 333 exemptions and COA's. The test sites have been placed under stricter standards than non-test site COA users. This is an unduly burdensome process for the test sites. An interviewee stated how the increased standards placed on them makes them believe the FAA isn't even on their side, proposing the question, "Why would a company come to us, when we have a longer more difficult process, when they can apply for their own exemption through the FAA?" The current system is deterring business away from the test sites. Some companies may still express interest in the test sites due to their expertise, but it does question the FAA's dedication to the test sites.

One interviewee claimed the FAA hasn't provided direction because the moment they demand or require something from the test sites, the FAA would have to provide funding. This theory was supported by a report by the GAO (2015) in which they stated the following:

"Several challenges still exist with the test sites, including identifying the research that test sites should be conducting. According to FAA, it cannot direct the test sites to address specific research and development issues, nor specify what data test operators should provide FAA. Further, FAA officials told us that some laws may prevent the agency from directing specific test-site activities without providing compensation." (p. 15)

Although not in the form of money, the test site designation itself may be seen as a form of compensation from the FAA. The idea that each test site was awarded their designation, may be enough to allow the FAA to request specific research to be conducted by the test sites. No evidence was found determining if compensation must be in the form of money. The test sites have pointed out the lack of funding and direction from the FAA, but the FAA does spend time and resources to supporting the test sites (GAO, 2015). The test sites meet biweekly via telephone conference with the test sites, and in person every six months. According to interviews, often these meetings do not provide the test sites with much information, and have raised more questions than answers. In contrast, the FAA states its responsibility is only to provide oversight and standards that guarantee safe operations at each test site (GAO, 2015).

Collaboration

As mentioned, only three test sites committed to being interviewed. One test site denied to participate due to the competitive nature of the test sites. This was an unexpected response considering when those who agreed to be interviewed were asked if the test sites were more competitive or collaborative, all three responded stating they were collaborative. One test site went as far as to explain how if they believe a customer could be better served at another test site, they will direct them to that test site. It is counter-intuitive that in a for profit setting, a test site would allow another to have its business. On the other hand, a different test site stated that all the test sites will win once they get the market going. Yet with three test sites agreeing on the collaborative nature, three refused to be interviewed, which may or may not be related to competition. If competition is what kept three from

interviewing, it would be an interesting culture divide that half believe they are collaborative and the other competitive.

Confusion of Test Site Roles

Amongst the results was a consistent theme regarding misunderstanding and confusion. It is unclear as to what purpose the test sites serve to the FAA and vice versa.

Contribution to Regulations

Upon announcement of the test sites, the FAA stated that data collection from the UAS test sites would contribute to the FAA's efforts in regulation making. According to the GAO report (2015), the test sites provide operational and safety data from each flight to the FAA to support UAS integration. This statement is conflicting to the results found from interviews conducted with the test sites. According to those interviews, some do not believe the data they provide the FAA is contributing to the FAA's development of regulations. The test sites provide the FAA with the same data that any other COA user would provide and nothing more. They are restricted from giving the FAA any additional information that they haven't asked for, stating it is because the FAA is not funded to support the effort. Another interviewee explained that he/she believes it to be a long term goal. Although they are only providing the FAA with very minimal data, one interviewee stated they will be contributing to UAS regulations by participating in rule making bodies, and providing a voice for the test sites and unmanned aircraft by attending NextGen meetings.

Each test site may have more data to give the FAA, but the FAA is not interested in utilizing it. The test sites have firsthand operational experience working with unmanned aircraft, and have the ability to assess areas of strengths and weaknesses, yet the FAA only wants a very limited amount of data from each test flight. It could very well happen that the FAA will repeat a mistake that the test sites have already made. The FAA could avoid time and resources wasted, if they fully utilized the test sites to their advantage. The test sites have very valuable information and ideas that could decrease the burden of the FAA in its efforts to establish regulations.

Section 333 Exemptions

In September 2014, the FAA granted six aerial photo and video production companies exemptions to allow for use of unmanned aircraft (Federal Aviation Administration, 2014b). This exemption requires the companies to perform line-of-site day operations performed on a movie set, flown by certified private pilots. This exemption falls under Section 333 of the FMRA and originally coined the term "film industry waivers" representing the first grouping of the Section 333 Exemptions administered to film companies. The Section 333 exemption was part of the 2012 FMRA and authorizes low-risk UAS operations prior to the final small UAS rule (Federal Aviation Administration, 2015b). As of April 9 2015, 137 exemptions had been granted spanning a range from insurance companies to precision agriculture. Each exemption is available on the FAA's webpage for review.

Small UAS Rule

The Notice of Proposed Rule Making (NPRM) for small UAS was issued in February 2015 and allowed small UASs weighing under 55 pounds at 500 feet AGL and below to operate in daylight under visual-line-of-sight and in confined areas (Operation and Certification of Small Unmanned Aircraft Systems, 2015). The FAA hopes the final ruling will come out 16 months after the NPRM, which would enact the regulation two years late from when Congress had required based upon the date set by the FAA Modernization and Reform Act of 2012 (GAO, 2015). In questioning the test sites regarding the issuance of the NPRM for small UAS and its effect on their test sites, one test site said the NPRM had already affected them. Individuals and businesses had contacted them to inquire how they could begin flying small unmanned aircraft. Another test site mentioned it had not affected them yet, and that they expect to collaborate over the next few years with the FAA. They viewed it as a positive step towards UAS integration into the NAS. They believed it would change their customer landscape, but allow customers to operate with them, rather than under them. Surprisingly, a third interviewee stated they believed the small UAS rule would have no effect on them because their focus is on aircraft flying above 500 feet which is an area that extends beyond the limitations of the NPRM. This test site also mentioned they did not expect to respond to the small UAS rule. The difference in responses on this topic shows the variety of operations from test site to test site, some concerned with smaller operations, others with larger.

Specialization

According to the FAA's website (FAA, 2013b), each test site has a research specialization. One interviewee pointed out that they believe that in the FAA's press release, the FAA spread their requirements across all test sites, without really considering each test site's operational advantages. One test site claimed that their specialty was not even listed by the FAA, and that they are not currently working on anything directly related to the specialization that was listed.

Uncertain Future of the FAA Test Sites

Based on results, the future of the test site program is unclear. Both opportunities and misfortunes lay ahead of the individuals closely involved.

UAS Center of Excellence

Congress directed the FAA to develop a UAS Center of Excellence (COE) in January 2014. Stated by the FAA, the COE will assist in a variety of research needs including air traffic control interoperability, airport ground operations, control and communication, detect and avoid, human factors, low altitude operations safety, noise reduction, spectrum management, UAS crew training and certification, UAS traffic management, and UAS wake separation standards (Federal Aviation Administration, 2014c).

The COE is an interesting creation, its goals sound similar to that of the test sites. All three interviews indicated support of the development of the COE and believe it will become a partner to the test sites. In one interview, a representative stated that he/she

expects the COE will be forced to collaborate with the test sites, especially as their means to obtain access to airspace. At this point in time, the COE award has not been announced, but its expertise spreading across partnerships with multiple educational institutions, will assist the FAA in reaching its research goals. The test sites are expected to remain operational based on the claims that the COE will be required to utilize the test sites, in turn, giving the test sites further purpose.

Accomplishments

Accomplishments listed by the test sites ranged from noting successful flights and acquiring access to airspace, to hiring top personnel and beginning facility construction. Success for the first flights was not because of the ability to get an unmanned aircraft in the air, but rather celebrated because of the ability to do it legally under the FAA's restrictive requirements. The ability to cooperate and develop partners with other states was listed as a milestone, as it expanded and diversified operations and expertise from the individuals involved. Table 2 shows activities conducted by five of the six test sites as of March 2015 from a report by the GAO.

Figure 2: Overview of Five Designated Test Sites' Activities since becoming Operational (Government Accountability Office [GAO], 2015)

Table 2: Overview of Five Designated Test Sites' Activities since Becoming Operational

Type of test site activity	Overview as of March 2015
Total Unmanned Aerial System (UAS) Flights at FAA designated test sites	• Over 195 total UAS flights • One test site has had over 80 UAS flights since becoming operational.
Number and types of certificate of waiver or authorizations (COA) received	• Five test sites hold 48 COAs. • One test sites held 4 broad area COAs allowing flights over nearly the entire state by specific aircraft. • Four other test sites were seeking COAs for large flight ranges that could apply to any aircraft.
Number of special airworthiness certificate for experimental aircraft	• One test site has reviewed and approved an aircraft to operate under an experimental certification. • Three test sites have certified representatives affiliated with the test site to review and approve and aircraft for experimental certification.
Signed contracts with UAS companies	• Five test sites have 22 contracts with industry groups and companies to conduct UAS operations at their respective test site. • These contracts are to allow the test sites to generate revenue. • All test sites have additional negotiations with companies underway.

Source: FAA designated test site officials. | GAO- 15-486T

Further Possibilities

The FAA's lack of support claimed by interviewees shows the FAA's disinterest in the test sites. The FAA was mandated by congress to start the test sites, and if it were up to the FAA, there may not be any test sites. That also brings into question, what the FAA plans for the future of the test sites.

Since announcement in December 2013, the test sites have been ambitious in their efforts in self sustainability. If they are to continue, further support and guidance is needed from the FAA. From interviews, it has been concluded that the test sites have support from their institutions and governing bodies, as well as from the public. It is advantageous for state and local government to continue supporting the test sites to drive industry and the local economy.

If the FAA retains the test sites under their supervision, a change in culture and management organization would be their most influential transformation. Based on the aforementioned results, the test sites believe they are a nuisance to the FAA, and that the

FAA did not want them, but was forced based on congressional mandate. One test site employee pointed out that the test sites were originally planned to be a five year program, starting in 2012 and ending in 2017. The selected test sites weren't announced until December 2013, which means the FAA had already used nearly 2 years of the original timeline before the test sites were even announced. The FAA's lack of direction to the test sites makes one test site believe they could be trying to run out the five year plan and dissolve the program altogether. The FAA could still pull the plug on the program in 2017, however, that will not be fatal to the life of the test sites themselves.

All responding test sites agreed that they were planning long term, with or without the FAA. The goal is longevity, and they hope the test sites can demonstrate safe integration into the NAS to provide individual customers with what they need.

It's questionable why the test sites are under the FAA's supervision. The FAA's mission is to maintain safe and efficient airspace, and they do this through regulation. The FAA does not conduct pure research, as do other government organizations such as National Aeronautics and Space Administration (NASA) and the National Science Foundation (NSF). A potentially more supportive structure for the test sites, may be under NASA or the NSF's supervision rather than the FAA. This would allow an atmosphere more conducive to research.

We cannot predict the FAA's next move, they very well may have a larger plan in mind for the test sites, but based on their actions thus far, it is difficult to determine whether or not they are on the same side as the test sites. An individual responded stating that if the FAA would have wanted the test sites, they would have made it work, and would have

allocated funding to contribute to the national effort put forth by congress, but they haven't done any of that. Another said something similar, "They [FAA] should use us, delegate us authority… use us as congress intended." Based on these responses, it is the perception that the FAA is uninterested in continuing the test sites beyond the 2017 requirement.

Currently, 14 states are covered by test ranges administrated by the six UAS test sites. The FAA has stated they are looking to continue to expand the number of UAS test ranges, but not the number of test sites (GAO, 2015). This would increase accessibility to the NAS for industry operators, expand UAS operations across the U.S., and could increase business at the test sites. If the FAA plans to increase the number of test ranges under the test sites, it's logical to believe the FAA will continue with the test site program.

CHAPTER IV

RECOMMENDATIONS AND CONCLUSIONS

Weaknesses and Limitations of the Study

This study is restricted to the amount of data available to the researcher. Only half of the test sites committed to being interviewed, and therefore may give a bias view of only those test sites willing to speak with the researcher. Access to certain information from the FAA is unavailable to the general public at this time, and a lack of response for FOIA requests limits the study. The recent initiation of the test sites means only very limited amounts of information was available. The confidentiality provided for the test sites who participated in interviews makes it difficult for future researchers to fact check the data presented.

Recommendations for Further Study

Due to the recent establishment of the UAS test sites, there has only been a small window of time available for research. Future research should continue to look at how the FAA is utilizing test site data, the UAS test site program, and its contribution to FAA UAS policies. A study including all six test sites would be advantageous, as well as researching the economic benefits of each test site. On a larger scale, research on international UAS regulations would provide a picture as to how the United States compares to the international community.

Conclusion

In a sink or swim environment, based on the lack of instruction from the FAA, the test sites have stayed afloat and made a name for themselves through industry partnerships. The test sites have the capability to survive with or without the FAA's direction and support, as they've proven thus far. It would be profitable for the FAA to take advantage of the knowledge and information the test sites can provide in moving forward with UAS airspace integration. At this point, the test sites have not contributed to FAA regulations and therefore do not need to be under their supervision. From its disheveled beginning, the test site program can still regain control of its original intent with proper dedication of resources from the FAA. The researcher believes the FAA should be held responsible for the current state of the test site program. Congress mandated the FAA start the test sites in hopes it would push the FAA forward in making regulations for unmanned aircraft, but instead they have been unsuccessful in meeting deadlines and providing a structure for the test sites. The FAA has not been under any repercussions and continues to move at a less than desirable pace. Other countries continue to push ahead of the United States, forcing benefits from development to the international market. The FAA is at fault to these allegations. To improve the system, the FAA needs to address its plans for the test sites. Without the FAA, and if official FAA test site designation is lost, the test sites already have the infrastructure to continue on their own to support industry as test flight centers, providing an environment for safe operations. The test sites do not need the FAA to be successful and should be allowed to continue. The results have shown that the ambition of the individual test sites may outlive the FAA's support. Therefore, the researcher believes the test sites would be

better off without the FAA under its current support system. If drastic and proactive changes are made, it would be beneficial to both the FAA and test sites to continue as a partnership. Only time will tell where the future of the test sites will lead. Providing safe operations of unmanned aircraft is an important and noteworthy accomplishment, and that alone is a worthy goal and current success of the test site program.

APPENDICES

Appendix A

List of Terms

AED- Automated External Defibrillator

DOT- Department of Transportation

FMRA- FAA Modernization and Reform Act of 2012

FOIA- Freedom of Information Act

GAO- Government Accountability Office

IRB- Institutional Review Board

NAS- National Airspace System

NextGen- Next Generation Air Transportation System

NOAA- National Oceanic and Atmospheric Administration

RPA- Remotely Piloted Aircraft

UAS- Unmanned Aircraft System, Unmanned Aerial System

UAV- Unmanned Aerial Vehicle

Appendix B

Interview Questions

- How did the test site begin? Who submitted the application and why were they interested?
- How is your test site funded?
- How is your test site structured? Departments (operations, safety, etc.), number of employees and positions.
- According to the FAA, all 6 test sites meet in person every 6 months, what are these meetings like? What is accomplished?
- Each test site is said to have its own specialization, what is your specialization?
- What has your test site accomplished?
- How many flight operations has _____ had to this point?
- What is your test site currently working on?
- Do you find your test site has support from the public?
- What are some of the largest obstacles you've encountered?
- What type of culture exists between the test sites? Collaborative or competitive?
- What assistance does the FAA provide you?
- What advice do you have for the FAA concerning UAS policies and regulations?
- What advice do you have for the FAA concerning UAS Test Sites?

- Do you think the information you provide the FAA is contributing to forming new regulations?
- The FAA is currently planning a UAS Center of Excellence, do you think this will affect your test site?
- How do you think the small UAS rule will affect your test site? Positively or negatively?
- What is the future of you test site?
- Is there anything else you'd like me to know? Or anything you feel you'd like to clarify?
- If I have further follow up questions, would you be willing to speak with me again?

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