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Leonard Transportation Center

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CALIFORNIA STATE UNIVERSITY
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Jack H. Brown College
Business and Public Administration

Inland Empire Regional Mobility Dialogue Series

Results and Summary

Feb 18, 2020

Drone Development in the Transportation Sector

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SBD
International Airport

San Bernardino
Valley College

HNTB

Foothill Transit
Going Good Places

LANE
SECURITY PAVING COMPANY, INC.
I-10 CORRIDOR EXPRESS LANES (CONTRACT 1)

exp.

GLA
GLOBAL LEADERSHIP ALLIANCE

HDR

PPMGroup inc.

Introduction

Drones are rapidly becoming more popular and accessible for industry and individual use. They are still in the infancy stage in terms of mass adoption, but drones have already broken through fixed traditional barriers in industries which otherwise seemed impervious by similar technological innovations. Over the past few years, drones have become central to the functions of numerous businesses and governmental organizations. They have managed to impact sectors of industries that were either stagnant or underdeveloped. Increasing work efficiency and productivity, decreasing workload and production costs, improving accuracy, refining service and customer relations, and resolving security issues on a vast scale are a few of the top impacts drones offer industries globally.

Furthermore, drone technologies are advancing quickly as another mode in the transportation sector. The uses in transit include surveying and data collection, function as tools for construction projects, and there are plans for air taxis and deliveries in the future. There are a number of obvious security challenges that come with drone usage and new regulatory frameworks need to be established to maintain safety. This Dialogue showed industry, the federal government, and the local community perspectives on the development of drone technologies for use in the Inland Empire.

Experts for this Dialogue included:

- Grant Hosticka, Solutions Engineer, DJI
- Paul M. Foster, Ph.D., Program Manager, FAASTeam
- Dan Dalton, Executive Vice President, Strategic Partnerships Airspace Systems
- Curt Hagman, Fourth District Supervisor, San Bernardino County

The major takeaways from this discussion were increased information about the different uses for drones and how they can benefit our region.

Grant Hosticka, Solutions Engineer, DJI

Introducing the drone conversation was Grant Hosticka, Solutions Engineer at DJI, a flying and camera stabilization company that develops and manufactures drone technologies. As one of the first to graduate with a degree in unmanned systems, Hosticka is considered an expert on drone solutions and their use cases. He began the Dialogue by showcasing several drones such as the Maverick V2 Enterprise, which is one of the smaller drones showcased. “The idea is in 30 seconds to a minute, you pull out the drone, unfold it, grab your controller, power them both on, and you are ready to roll,” explained Hosticka. One of the advantages to drones is that they can be used in a variety of ways. They are not only easy to deploy, but “you can also mount some different payloads on the drones as well, like a spotlight, a speaker, or a strobe light for night flight.”

Hosticka also explained how some of the cameras on drones can be used. Using cameras on drones can be advantageous in certain circumstances, explained Hosticka. “This one has zoom capability, so you can do an inspection, say you don’t want to necessarily fly close to the rail or close to obstacles, you are able to zoom in and get a better view. There is also a model available with a thermal camera, so you can get heat levels in certain areas. Once again, if you’re doing an inspection, you see something overheating, an anomaly, both availabilities on the drone.” He also explained how with bigger drones, such as the

Matrice 200 series, “you are able to improve the payload as well, so really your payloads are increased by the resolution on the thermal camera and then also the ability to mount other sensors, such as methane gas detection, looking at pipelines, or a more complex multispectral sensor, or the ability to bring your own sensor as well.” The drones showcased in this Dialogue have average battery lives of 20-35 minutes and can travel up to 5 miles.

Hosticka highlighted cases where drones would be useful by showing a short video of the number one ferry operator using drones to autonomously inspect terminals and record placard numbers in order to inventory where each one is. This would save time rather than someone having to manually inspect and record these terminals. In doing so, the operator is able to cut down on cost and fuel. Another example of a drone use case is with the North Carolina Department of Transportation. The North Carolina DoT has an environmental analysis unit which sprays pesticides and herbicides where there are invasive species that threaten the health of plants or crops in the area. According to Hosticka, “you can attach tanks of solution to drones, including DJI drones, and they can spray the material in a pattern across a grid, or spot spray as well.” Drones can also be used to monitor airports by inspecting runways for cracks, debris, or any growing plants that may affect operations.

Other use cases include rail inspections, accident reconstruction, and orthomosaic mapping. Hosticka explained that drones can be useful for accident reconstruction, stating “the idea here is you have a major highway or even a normal road that’s being shut down due to an accident. They actually put a tape measurer out on the ground next to their scene and measure the distance from each of those articles they found to the baseline and you do some math, Pythagorean Theorem, and you are able to build a model after the fact.” The problem with having law enforcement or DoT employees doing the calculations and measurements on the ground is that you have to shut down either the lane or the whole road, which takes a lot of time and can cause more traffic and possible accidents. With drones, you are able to measure the distances precisely and quickly, allowing the accident reconstruction analysis to be much quicker. Closing down roads also comes at a great cost to the region that can be avoided with the use of drones for this purpose. Hosticka explained cost by stating that, “Washington State Highway Patrol estimated that they are losing $300-400 per minute that our road is closed, due to the loss of productivity.”

Hotsticka explained in detail how drones accomplish accident reconstruction. He shared that “the pilot will take the remote controller and connect it to a tablet and think of Google Maps coming up. They can then draw a polygon around a specific area that they are looking to fly and then the drone will autonomously fly that polygon, taking pictures at set intervals, and then after the fact they can use those pictures that they took to stitch together what’s called a orthomosaic, or basically a high resolution map of the scene through photogrammetry, which is combining photos together into a 2D or 3D map.” These are just some of the many possible uses of drones in transportation.

Paul M. Foster, Ph.D., Program Manager, FAASTeam

Paul Foster, FAA Safety Team Program Manager and OJT Program manager, continued the drone conversation. Foster has been involved in higher education for over 35 years and has a long history in the aviation industry. Foster explained several different regulations and restrictions regarding drones. The first topic that he touched on was recreational use of drones. Most people have the misconception

that drones are a toy and that they do not have to be registered in order to pilot them. Foster corrected this by saying, “If they are over half a pound they have to be registered.” He also corrected some misinformation by stating that “the FAA has since kicked in a LAANC program, basically what that is there are some areas around the United States that the FAA has gotten around with others and identify certain areas in which you can go and have fun. However, people will get confused between the regulation and what LAANC is about.” These LAANC areas are areas of airspace which are designated where UAS (Unmanned Aircraft Systems), including drones, can be flown recreationally without needing authorization by air traffic control. Foster also noted that drones are not able to be flown within 5 miles of a towered airport or within 3 miles of a non-towered airport, unless proper authorization is given by air traffic control priorly.

Foster went on to explain non-recreational regulations on drone usage. When drones are used for non-recreational purposes, the pilot must have a remote pilot certificate. Foster explained the process by stating that “you have to be at least 16 years of age and you have to pass TSA vetting. You have to take a test through a testing center and then it gets routed up the FAA system, the TSA takes a look at it, and then you get your remote pilot certificate through the mail. You go fly in class G airspace without ATC permission, but Class B, C, D, and E require ATC permission.”

Dan Dalton, Executive Vice President, Strategic Partnerships Airspace Systems

Dan Dalton, Executive Vice President for Strategic Partnerships at Airspace Systems, Inc., focused on security and mitigation of drones during his presentation. Dalton has a significant background in security and aviation, and has held positions as the Director of the U.S. Department of Energy (DOE), Office of Nuclear Threat Science within the DOE Office of Counterterrorism and Counterproliferation, and as a commercially-rated land and seaplane pilot. He has also been a FAA Part 107 pilot and instructor.

Dalton opened his presentation underscoring the importance of security, stating “to really see this industry scale (drones), from a commercial perspective, you have to have security as a prerequisite.” The regulatory history of drones, although short, has evolved greatly in recent years. Originally under the regulation of the Department of Commerce, drones are now regulated by the FAA. During the beginning of regulations under the FAA, drones were initially approached like any other aircraft, which caused practical implementation and enforcement issues. Some regulations, like mandating that a pilot operating manual must be on board, were flawed, because these manuals would be heavier than the drones themselves. Now, drones are classified separately and have their own regulations, which has addressed some confusion that early policies caused.

As Executive Vice President for Strategic Partnerships at Airspace Systems, Inc., Dalton expanded on some of the main functions of Airspace Systems, Inc. “We basically provide end to end detection, identification, and then if necessary, mitigation which just means shooting down drones to our customers,” said Dalton. Airspace Systems, Inc. is specifically designed to address those who fly drones outside of authorized airspace. Dalton sums up these people as “the careless, the clueless, and the criminal.” Airspace Systems is also involved in in research and development with companies such as Cisco, Apple, and Google, and is one of the first companies with drone identification patterns.

Lastly, Dalton explained how drone aircrafts must have a tail number, but because drones are so small, they have something called remote ID. “What is a remote ID? It is basically a license plate for drones. Just like your car has a license plate, your drone should have a license plate,” explained Dalton. Remote ID works by broadcasting the identification information of a drone, so that it can be identified by the FAA or law enforcement if it is flying in airspace that it should not be flying in.

Curt Hagman, Supervisor, San Bernardino County

San Bernardino County will be opening in the near future its own drone department. Supervisor Curt Hagman joined the Dialogue to discuss the future he envisions for the Inland Empire and drone operations. Hagman was elected to serve San Bernardino County’s Fourth District in November of 2014 and was named Chairman of the Board of Supervisors in January 2019. “I like to think I am a little visionary or futurist for government and so I really believe in this stuff, and I really appreciate everyone taking the time to focus on it and help us build the rules, the regulations as we go forward. I think that technology as we know is going much faster than the rules and regulations that we deal with on the state and federal level,” said Hagman. Large parts of Supervisor Hagman’s job involve being a liaison between the California Federal Legislature and San Bernardino County, helping determine the needs of the region, and exploring how rules and regulations can keep pace with evolving technology. California has experienced turmoil with several fires and floods recently, which requires the use of helicopters for search and rescue as well as many other resources. “We need our own civilian equivalent to out of lock, out of sight drones for these type of things, so it is a lot cheaper to fly over those fires or disaster areas and be able to deploy resources the right way,” said Hagman.

Hagman believes 3D transportation is the direction of the future. Soon, it will be too expensive to build freeways and, with the Inland Empire being the logistics hub of the Western United States, innovations must be developed that can change the way people and things are moved from place to place. The Ontario Airport is currently exploring ways to use automation to move cargo around. According to Hagman, who sits on the Ontario Airport Authority Board, officials are working with the Boring Company to look at how a connection can be developed between Metrolink South and Metrolink North through underground tunnels to connect to the airport for faster and more economical cargo transport.

“This whole concept of 3D transportation is definitely our road forward, so I appreciate the Leonard Transportation Center’s work on that as we work to see what the future is and the technology is here, we need to figure out how to regulate it, control it, utilize it in the best way possible. Specifically, UAVs, we have the largest area to cover in the United States, 22,000 square miles to cover and it is tough,” said Hagman. Every time there is a rainstorm or a fire, imagine monitoring the 15 freeway between the Inland Empire and Las Vegas, NV. The 15 Freeway is a large stretch to cover and, with the use of drones, the county can determine what kind of resources to deploy if there is a traffic accident. Presently, there are a lot of government resources being used for this purpose and the county is trying to figure out how to use remote technology in different ways to make the government more efficient with limited resources. Right now, the current regulations state all drones must still be flown within line of sight, which limits possible applications. There are five departments using 15 drones in San Bernardino County so far and Hagman believes there is more that can be done once is it possible to graduate into the out of line of sight versions.

“One of the things we are talking about using drones for is code enforcement. We have a lot of illegal dump sites all over the place, drones can help us figure out where there are and clean them up,” said Hagman. Illegal dump sites are expensive to clean up and, if they sit for an extended period, they have detrimental effects on the environment. In addition to illegal dump sites, drones can aid in finding structures and buildings that have been built without the proper permits. Another benefit is that fire departments will be able to utilize drones to locate the most useful places to access ground resources in case of emergency.

This technology gives us the ability to put up a drone with a telecommunications repeater on it so emergency responders can help those in need. “When we have a big earthquake and all the towers go out of whack and we don’t have the cell phone coverage like when Santa Barbara floods came and knocked out the cell phone tower, we didn’t have the ability to go respond to those calling for help because cell phone were not working,” said Hagman.

Drone use is also cheaper than using helicopters and when it comes to search and rescue efforts. An example of this is a recent train accident in which the train was carrying gas in one of the tanks and, instead of gearing up the emergency response team with the gas masks and hazmat suits, officials sent in a little drone to make sure there was nothing leaking. Once officials were able to confirm there were no gas leaks, emergency responders could then send a team to do damage and assessment control.

Another practical use for drones in San Bernardino County is to help monitor the flood control channels. Currently the only way to check the flood channels is to send deputies down to make sure there are no homeless people living there. When it rains and the channels fill up, the homeless have no way of being warned about flooding. Drones and UAVs (Unmanned Aerial Vehicle) can be used for the mapping of the channels before a weather incident. Furthermore, they can be used to observe what is growing in the channels and to check and see if there is any debris that needs to be removed from blocking water flow. “So, what are we going to do with all this information? As we surveyed all our county departments, and everyone had some sort of interest in the use of drone. We are talking about establishing a drone department this year, a UAV department,” said Hagman.

The County is also working with the San Bernardino International Airport to start a drone center of excellence and working with the FAA to do some testing onsite. The site can be an ongoing area used for testing and the San Bernardino Airport has a wash to the east and eventually leads out to the high desert, which is an ideal location for long range testing. Hagman concluded by exploring the long term applications and directions of this technology, stating “How do we integrate that data, which is the ultimate goal of all this, how do we integrate the data we collect from all these things into ESRI or something else that we as policy makers can make resource decisions to deploy the correct way and so it’s an exciting time for us with this technology. But there is a lot of things that we don’t know exactly where to go with and what to do with yet, as we discover and as we grow, but with the partnerships, especially in this room, I think we can have one of the centers expand on what we are doing in the county as we move forward.”

Moving the Dialogue Forward: Ideas from the Participants

After the presentations, the Dialogue attendees discussed the ideas presented and worked together in groups to discuss solutions to move forward. The top three ideas from each table have been categorized and summarized below.

Safety features and regulations. During the roundtable discussion several attendees considered the importance of implementing drone safety features and regulations.

- The cybersecurity aspect needs to be addressed further in order to keep drones from being hacked.
- Moving forward, it would be useful to implement some form of fingerprint registration and facial recognition for drone users.
- With how rapidly drone use is increasing, work with drone manufactures and FAA to develop regulations should occur as soon as possible.

How to educate future workforce to utilize drones. A few of the participants discussed how institutions can prepare students academically for professional service to San Bernardino County's new drone programs.

- Engage students from a young age and start teaching them about drone technology in middle school or even earlier.
- Start introducing drones in the classroom to garner support for the commercial UAV industry.
- Educate our youth and start to build a capable workforce that can utilize drones in productive ways.

The Leonard Transportation Center (LTC) at California State University San Bernardino (CSUSB), presented a bi-monthly dialogue series on topics relevant to the future of transportation in the Inland Empire. The series, which was open to the public, was sponsored by HNTB Corporation and was held every other month starting in February 2018.

Dialogue topics ranged from understanding the current mobility dilemma and its causes to potential solutions like congestion pricing, transit; emerging technologies such as autonomous and connected vehicles and new ways of funding transportation infrastructure. Attendees had the opportunity to hear from transportation experts and engage in vigorous discussion about the transportation challenges facing the Inland Empire.

About Leonard Transportation Center

The Leonard Transportation Center (LTC) at California State University, San Bernardino opened in 2006 with a focus on regional transportation needs. The vision of Bill and Barbara Leonard was to create a center that focuses on the unique transportation opportunities and challenges the Inland Empire faces. Today, the LTC is working to expand its research and student engagement programs. Focal points include transportation management and governance issues, development of new technologies, and transnational studies. Their vision is to work collaboratively to seek solutions to assist residents, businesses, government and nonprofit agencies, and international partners to work together on improving sustainability and quality of life in the Inland Empire. For more information, visit www.csusb.edu/LTC

About HNTB

HNTB Corporation is an employee-owned infrastructure solutions firm serving public and private owners and contractors. HNTB's work in California dates back to its founding in 1914. Today, HNTB continues to grow in size and service offerings to clients in California from seven office locations, currently employing more than 350 full-time professionals. With more than a century of service, HNTB understands the life cycle of infrastructure and addresses clients' most complex technical, financial and operational challenges. Professionals nationwide deliver a full range of infrastructure-related services, including award-winning planning, design, program management and construction management. For more information, visit www.hntb.com

About San Bernardino International Airport

Conveniently located in the heart of the Inland Empire, close to major freeways and just 60 miles from Los Angeles, San Bernardino (SBD) International Airport is strategically positioned to meet growing aviation activity, including cargo, business aviation, general aviation, and commercial airlines by providing competitive rates for aviation companies and local businesses looking to stretch their wings and expand their horizons. With extensive stretches of pristine runway and acres of prime land available for aviation development, SBD International Airport is ready to help our community and region reach new destinations. For more information, visit www.sbdairport.com

About San Bernardino Valley College

San Bernardino Valley College will become the college of choice for students in the Inland Empire and will be regarded as the alma mater of successful, lifelong learners. We will build our reputation on the quality of our programs and services and on the safety, comfort, and beauty of our campus. We will hold both our students and ourselves to high standards of achievement and will expect all members of the college community to function as informed, responsible, and active members of society. For more information, visit www.valleycollege.edu