

*Oklahoma Innovations* Radio Show

Air Date: October 10-11, 2015

Guests: **Jamey Jacob** and **Daniel Will**, Oklahoma State University; **Dyan Gibbens**, Cowboy Technologies; **Stephen McKeever**, Secretary of Science and Technology; and **John Walker**, The Padina Group

>> From the OCAST Radio Network, this is *Oklahoma Innovations*, a weekly science and technology radio magazine, brought to you as a service of OCAST, the Oklahoma Center for the Advancement of Science and Technology. OCAST is the state's only agency whose sole focus is science and technology. The OCAST mission is to identify and fund promising research and technologies that allow Oklahoma to compete in a global market economy from our own backyard. This program features some of Oklahoma's most gifted scientists, inventors, entrepreneurs, manufacturers, educators and business leaders who all have one common goal: developing technology based economic growth for all Oklahomans. Now, here are your hosts Gary Owen and Chad Mullen.

[ Music ]

>> Welcome to this week's edition of *Oklahoma Innovations*. Chad Mullen and I are coming to you from the university in Stillwater, known as Oklahoma State University, the color of orange, and Pistol Pete's headquarters, the Cowboy's, and we're going to be using that label a lot today because we're going to talk about unmanned systems, aerial systems, right?

>> Gary, we're happy to be here at OSU this week. They're a host to the World's Best Technologies Open Innovation Forum on Unmanned Aerial Systems. So WBTs, unmanned aerial systems event. It's a great event that brings folks, really, from several states here to Stillwater to talk about what's next for UAS and OSU plays a very, very integral role in the UAS system here in Oklahoma.

>> They do. And, now, for those of you that think about unmanned aerial systems, the first thought is the, we use the short form of drone, but there's a lot more to the technology than just drone technologies is what we're going to talk about today. And, now, where is this technology going? I tell you, you're in for some really interesting comments on this program this week. Talk about our first guests.

>> Well, our first guest is Dr. Jamey Jacob, and he is a professor here at Oklahoma State University. He's the Ray and Linda Booker Professor of Mechanical and Aerospace Engineering. And he is into a lot of things including aerodynamics, unmanned aerial vehicle design and flight testing, vortex dynamics, flow control, bio fluid flow, plasma physics, and inflatable aero structures, which sound very interesting. We may have a chance to talk to -- but Dr. Jacob, welcome to the show. And tell us a little bit about what's going on at OSU, and how you guys are becoming a leader in unmanned systems.

>> Great. Thank you for having me. I really appreciate it. You know, of course, we've been working on unmanned aircraft systems here for quite some time. You know, just to toot our own horn here, one of the things that we recently recognized at was the second was best place in the country to get an unmanned aircraft systems related degree, second only to Embry-Riddle the largest aeronautical school in the world. So, we're very excited about that and happy that we're

being recognized for all of our achievements. You know, of course, we've been working on this for quite some time and both from the educational stand point as well as the research. One of the things that we're currently working on now is, we recently received a \$6 million grant from the National Science Foundation to develop unmanned aircraft systems technology for meteorology.

>> Nice.

>> This is called CLOUD MAP, which stands for collaboration leading operational unmanned development for meteorology and atmospheric physics, and it's really devoted to developing technology to help meteorologists improve their forecasting methods, and atmospheric scientists use unmanned aircraft as an everyday tool.

>> So it this, like, a replacement or in use with weather balloons, that kind of -- is it a better technology?

>> It is. You know, if you look at weather balloon technology where much of our forecasting comes from right now. In the state of Oklahoma, we only have two weather balloons that are launched every day. One in the morning and one in the afternoon. And they're able to do really amazing things using that technology. What we want to be able to do is take this, really now, to the 21st century type of technology to be able to have on-demand user controlled information going back down to the forecasting. Some of the things that the weather balloons do really well, we get the high atmosphere.

>> Yeah.

>> High altitude stuff. Some were the radars and what radars usually only pick up humidity or water droplets in the atmosphere, but they don't see very well over the horizon. The things that unmanned aircraft do really well are things close to the ground where you don't want to have manned aircraft at or you can't have balloons at, and that's where this technology will really be a game changer.

>> Well, that's a -- Dr. J, that's amazing, and some amazing work, and I assume you collaborate a little bit with the University of Oklahoma and the National Weather Center down there?

>> We do. Certainly, you know. OSU has the expertise in the unmanned aircraft, and, of course, OU has the world's leader in meteorology with the National Weather Center now in the national severe storms laboratory. So this is a partnership between OSU, OU, and two other universities. University of Nebraska and University of Kentucky.

>> That's fantastic. Now, what else? Is there some other exciting stuff going on here at OSU with your program?

>> Well, one of the things that we're really focused on, you know, since there's such a explosion on a commercial side in terms of using this technology for so many different types of applications. We've really been focused on first responders, precision agriculture, using these for utility line inspections, oil on gas. It's taking the technology that's being developed at OSU and transitioning that to the commercial marketplace. And that includes, you know, new start-up companies led by students and faculty, taking some of the really innovative and novel technology developed in our labs and having them be able to turn those into products that people can buy. And that includes our new autopilot technology that's recently been developed as well as some of our own UAV, such as atlas, which you'll hear about later.

>> Well, that's great. And tell us a little bit about on the autopilot. I mean, some of this is in the event that there is an operational issue with the aircraft that can help it land safely, is that correct?

>> Well, certainly. You know, when you talk about unmanned aircraft systems, we usually think about the aircraft, but it's the system that really makes it unique. The aircraft is really just a vehicle to one portion of it. We have the autopilot on board the aircraft, which is the brain of the entire project. So, you know, it's what makes everything work. Without the autopilot, you don't have an unmanned aircraft system. We've developed some very unique UAS autopilot technology that adapts to both vehicle and changing conditions in the atmosphere.

>> How does weather effect the operation because, when you talked about whether applications, how does weather, in general, effect operation of these vehicles because you, obviously, you want to be able to work under different conditions, particularly when you talk about first responder type situations.

>> Certainly, you know, because, currently, when we look at, you know, unmanned aircraft or drone technology, it's really only designed to fly in low winds and clear weather environment. And, so, we're developing technology both on the aircraft side, on the autopilot side, to allow the vehicle to operate in all weather conditions, which is vital for something like a first responder, you know, whether, you know, it's responding to a storm or responding to a wildfire, which is also a very weather-driven phenomena that the system didn't have that flexibility to adapt to these changing conditions.

>> And I guess the challenge that, as engineers, you have integrating with other technology, such as photographic or sensor related devices, are going to be mounted on these.

>> Certainly.

>> Devices. Talk about that.

>> Certainly. And we always have to keep in mind that without a payload, it's really not an unmanned aircraft system. It's just an airplane.

>> That's right.

>> That you're flying around for fun. So you have to have the payload on there and, you know, again, most of the commercial drone technology is, you know, using something like a visible camera, you know, like a GoPro or something similar to that. But what we're really doing here is looking at a novel sensors that measure what's going on in the atmosphere, and that includes, you know, things like neurological sensors, but also infra-red sensor, that are able to tell things about the atmosphere beyond our normal spectrum that we look at.

>> Chad, let's introduce our next guest, Daniel Will. Tell us about him.

>> Well, great information from Dr. Jacob, and we appreciate him being on. And he had, as he mentioned a minute ago, some of this technology's being commercialized and brought to market and Daniel Will is the executive director of Cowboy Technologies. And, Daniel, welcome to the show, and tell us a little bit about what your role is here at, kind of at the university, kind of not, so.

>> Yeah. No. Thanks to you. Thank you guys for having me on. I'm, as you mentioned, the executive director of Cowboy Technologies. Cowboy Technologies fits in to the university

through the Oklahoma State University Research Foundation, which is an overall entity used to help connect the university with industry and really help out with the commercialization of technology and connecting those with real optical market needs that are out there. As we know, there's great inventions going on at the university. There's great things going on in the mechanical aerospace engineering department with Dr. Jacob and others in that department and great students come in with great novel inventions, unique inventions, that really solve real world market needs and technology transfer from universities out to industry into real world, kind of, applications and products and solutions. It's always been a struggle for universities in general. Traditionally, universities have devoted to licensing to existing companies, that technology, when they can find the right match. But Cowboy Technologies, really trying to take the next step beyond that, in terms of looking at possible market and people and technology, fits to do things that start-up companies, not just licensing to existing companies, for commercialization purposes.

>> And, so, you have the ability or one of your goals is not only to provide possibly financial assistance but managerial assistance, market assessment, I mean, tell us a little bit about the process of a start-up that comes out of the university and comes to you for help.

>> Right. Cowboy Technologies, my staff and I, are constantly scanning across the university, again, we're look for those right matches. So, understanding who the great faculty are out there and what kind of novel, unique, innovative things they are doing, and we work very much hand and hand with our licensing and patenting function of the university of the research foundation to understand what is unique and novel coming out of university labs and those faculty institute and innovators. We're working to assess and start building business plans and go-to market strategies for those technologies. They look like they are novel, unique, protectable in the market either as [inaudible] or patentable. And start also assessing, you know, the people aspects can have great technology, can have great market opportunity potential, but if the people mix isn't right to do as a start-up company, that's the biggest impactful factor for making these things a potential success. And so we're kind of screening for those kind of stick-to-itiveness type personalities for both students and faculty to make it a potential success as a start-up company.

>> I would think as an investor looking for venture capitalist wanting to invest in technology like this, the potential of ROI down the line is pretty amazing, isn't it?

>> Absolutely. I think this is actually a great way to complement our traditional way of take transfer out into commercial entities, and, obviously, there's a royalty type of stream that can benefit the university from those types of commercialization opportunities. start-up companies have a lot of risk associated with them.

>> Absolutely.

>> There are a lot of things that can happen associated with them. There's a lot of failures that will happen with start-up companies, but there are some very big successes that can also happen. And, so, we're looking for those diamonds in the rough, those bigger, you know, big hit, market opportunities, huge return on investment opportunities that could really benefit the university and the state college involved, including the founding inventors and entrepreneurs.

>> And one of those companies, we're going to hear about on our next segment, get a little bit more detail on technology. But as Unmanned Cowboys, tell us a little bit about that company and why you're involved.

>> Yep. So Unmanned Cowboys is one of our first start-up companies that we've really identified early on as having some great novel, unique, and innovative technologies you get out of the Mechanical Aerospace Engineering Department with Dr. Jacob and students like Ben Loh and inventors in that department who have really come up with some novel, unique, protectable intellectual property in this really attractive, growing, aerial systems drone space. And, so, we see the market opportunity. We see the technology inventiveness. We see the people having the right mixture of stick-to-itiveness and follow-thoroughness, and we're excited to be partnering with them to commercialize that technology through Unmanned Cowboys helping them guide them through the managerial, the good market start-up process, and the funding needed to get them off the ground and going through our incubator here on the of west side of Stillwater.

>> Thank you, Daniel, for your time on the program. We've learned a lot more. When we come back, we're going to be talking with Dyan Gibbens. She's CEO of Unmanned Cowboys. We'll learn more about this technology. Pretty fascinating stuff here, guys and gals. When we return on Oklahoma Science Radio Magazine, *Oklahoma Innovations*. Don't you go away. A lot more to learn.

[ Music ]

>> Pancreatic cancer is the fourth leading cause of cancer deaths with a median survival range of only 6 months. As an oncologist, I see far too many families suffer from the effects of this terrible disease. We need better treatment options for patients.

>> With the support of the Oklahoma Center for the Advancement of Science and Technology, the researchers at Core Biotechnology have what they hope will eventually be a treatment, even a cure, for pancreatic cancer. They have identified a protein, that if blocked, may prevent tumors or keep them from growing. With help from OCAST and I2E, the team at Core was recently awarded an SBIR Research Grant to enable them to continue their research and move closer to a treatment for pancreatic cancer. If you're a researcher or a small business in Oklahoma and are considering applying for a federal SBIR funding, contact OCAST toll free at (866)265-2215 or visit us Facebook or our website at [ocast.ok.gov](http://ocast.ok.gov).

>> Now in its 20th year, this is *Oklahoma Innovations* on the OCAST Radio Network.

[ Music ]

>> Welcome back to Oklahoma Innovation. Chad and I are coming to you from the Unmanned Aerial System Open Innovation Forum in Stillwater, Oklahoma at OSU. And our next guest now is Dyan Gibbens.

>> Gary, I'm excited to have Dyan with us here. She's with a great company, Unmanned Cowboys, out here in Stillwater, and there's a student, who a few years ago I had the opportunity to meet, that was working on a prototype of an unmanned aerial system that really just, kind of, impressed me with the way it operated and the way it worked and Dyan's here to talk about that and what they're doing. And we're looking forward, so welcome, Dyan, and tell us about Unmanned Cowboys.

>> Thank you, Chad, thank you, Gary, for having me here. Unmanned Cowboys started in late 2014 with seed funding from Cowboy Technologies, and we developed technology-based solutions to enable safe autonomous aerial flight. And over the last four years, Ben Loh, who you mentioned, designed Atlas in altering land and air sphere for his PhD research to enable safe, proximate flight.

>> And, Gary, this sphere is pretty, or Atlas is what it's called now, is pretty unique in the sense that it self-rides, it's, well, it's actually so easy to fly, I can fly it.

>> It's a very sophisticated piece of equipment, but I have seen it and it's very, very different model of what we're used to seeing you and unmanned aerial systems. So, give us a little more description about this because, for our audience that may not know, the applications are going to be diversified with this kind of technology, is it not?

>> They are. So to talk about Atlas a little bit and then some of the applications. Atlas is a spherical UAV'S, a spherical exoskeleton around 17 inches in dimension, and it protects the propeller so it protects you from damage, it protects from injury, it protects from those things. And we also developed a proprietary adaptive autopilot in house, so we developed that which uses machine learning in different algorithms to adapt as it flies. And then for some of the applications we see it being used anywhere. Our initial market is first responders. So we see it being used to help save lives. There's also a lot of interest from indoor inspections. And, so, a couple places we recently flew it, we were in the U.S. Senate this summer in Washington, D.C. We were the first authorized drone flight in the Senate.

[ Laughs ]

>> Wow.

>> Which is exciting.

>> Impressive. Yeah.

>> Flew it in a lab for a large oil and gas company in Houston, and there's a large need. Again, our initial focus is first responders.

>> One of the advantages of the design is it kind of looks -- it's about, for our folks at home, it's about the size of a large basketball, maybe, an oversized basketball or one of those balls that you see in the aisle of Wal-Mart. All the equipment's contained within it, and so if you've ever bought one of these helicopters at the mall or tried to fly, you know, they crash, the wings break.

>> Right.

>> But this, I mean, you can, literally, drop it from the sky, so to speak, from a certain height. It's fairly indestructible, or?

>> It's pretty forgiving, so, you know, based on its, you know, internal space and design, it's spherical exoskeleton, it can absorb that shock and is, you know, different and distinctive about Atlas is, as you said, it can land, it can roll, it can actively and dynamically upright and then return to flight, so that's what truly separates it from other of these in the space. And you did mention basketball, you know, there is a drone camp this summer that BP sponsored, and we flew Atlas into a basketball hoop.

[ Laughs ]

So, not a lot of drones can do that.

>> Yeah. No. I guess so. Boy Thunder would love that.

>> Yeah.

>> That's right.

>> Yeah. That'd be great.

[ Laughs ]

>> So, when you talk about applications, let's say in commercial sector, what do you see this app, what do you see this device being used for?

>> So, we truly see it being used everywhere. Again, our initial focus is first responders, and beyond first responders, like you said, in the commercial world, we see it being used for indoor cluttered industrial environments, and, specifically, the equipment and transportation sector. So, large automotive companies are coming to us and asking to use Atlas to inspect a plant, verses using a man lift or scaffolding or ladder.

>> Oh, nice. Yeah.

>> And then, also, large transportation companies with different modes of transportation are wanting to use Atlas to inspect a plane, equipment, any sort of infrastructure inside but also outside. So Atlas is approved on a section 333 exception by the FAA, so it can be used for outdoors as well. Again, initial market is indoors.

>> You know what I'm wondering if this is a great device when you think about on our West and Eastern seaboard and even in the gulf for transport when we get imports into the country for inspections. Would it be used for that kind of an application for security reasons?

>> Absolutely. As you were saying, we envision it being used everywhere. You know, our focus, you know, is first responders. We're working with units in Colorado, here in Oklahoma, here in Stillwater and Texas, North Carolina, and, again, we are excited about its reach commercially as well. So, yes, absolutely could be used there.

>> And, Dyan, tell us a little bit about, what kind of tools and sensors could you mount on this device?

>> Good question. So, right now, what comes with it is what's called FPV, a first person view camera so you see what the camera sees, so that's on it. You can also have different HD cameras, 4K cameras, there's Sony action cam, GoPro 4K. We're also collaborating with FLIR. So FLIR has a new IR sensor called The View, and we're work to put IR on there for first responders.

>> Infra-red.

>> Infra-red. Yes. So, IR infra-red, excuse me, for first responders and other inspections as well which could be oil and gas, could be any sector.

>> That's pretty amazing. So, first responders, I mean, what kind of applications would they use this for? Or are you envisioning them doing fires or natural disaster or?

>> Any and all of it. So, exactly what you said. We envision this to help enable situational awareness and then provide safe proximal flight to people, to individuals, to see if there are survivors, to access damage, to report that damage back to people, and, again, if you're flying a multi-road or if you were to get stuck, could not return to flight, could not come back to you. So Atlas, again, can do those. Enable situation awareness and safe proximal flight.

>> When you talk about infra-red, you're talking about disasters, everything from earthquakes to tornados, hurricanes, where people might be caught under debris, or, I mean, those are the really nice application.

>> Exactly. And so, Ben Loh, you know, he lived here at OSU and, you know, bachelors, masters, PhD, and the inspiration stemmed from the Oklahoma City bombing 20 years ago, and I lived in Oklahoma City then. I remember the chaos. I remember my father trying to help and everyone trying to help, and if we had a tool like Atlas, then we could have, you know, better assessed the situation and, potentially, saved for lives.

>> Dyan, you've been a great guest. This is fascinating. We have a lot more to learn on this program, and you're going to learn how the unmanned aerial system technology is advancing so fast and the applications are coming so fast, so.

>> And, Dyan, they can go to [unmannedcowboys.com](http://unmannedcowboys.com)?

>> Correct.

>> To see them?

>> All right.

>> Yes, you can.

>> [Unmannedcowboys.com](http://Unmannedcowboys.com).

>> Yes. Fascinating stuff, you want to learn about it. We have a lot more to talk about when we return from Stillwater at OSU on your Science Radio Magazine, *Oklahoma Innovations*. Stay with us.

[ Music ]

>> If you enjoy listening to this program, tell us. Better yet, like us on the OCAST Facebook page. There is more *Oklahoma Innovations* to come on the OCAST Radio Network.

>> When I invented my new product, I faced a lot of challenges from securing capitol to recruiting qualified employees. It's a very complex path from innovation to the marketplace, and I needed some help navigating the process.

>> The Oklahoma Center for the Advancement of Science and Technology and its strategic partners, the Oklahoma Manufacturing Alliance and I2E, help entrepreneurs. They support existing and start-up companies. So they can succeed and create jobs, increase per capita income, and grow the state's economy. In its 26-year history, OCAST has funded nearly 25 hundred research projects and provided support to hundreds of Oklahoma based companies. The investments made in these businesses yield high returns for our state by strengthening and diversifying our economy. Advancing innovation is investing in a positive future. That's what OCAST is all about. For more information, call OCAST toll tree at (866)265-2215 or visit us on Facebook or our website at [ocast.ok.gov](http://ocast.ok.gov).

>> I'll graduate from college soon. I wanted real world experience that would make me stand out to potential employers. That's what I like about my internship. It's preparing me for a competitive job market.

>> With the support of the Oklahoma Center for the Advancement of Science and Technology, more than 500 Oklahoma students have interned with science and engineering companies. OCAST's intern program helps students connect with mentors, operate instruments not available in the classroom, build confidence, and gain practical experience.

>> The OCAST internship gives me the opportunity to put in the practice what I study in the classroom. It's a great learning experience and a chance to work with topnotch professionals.

>> Internships play an important role in connecting Oklahoma's brightest students to quality technology jobs in Oklahoma. Creating opportunities, that's what OCAST is all about. For more information, call OCAST toll free at (866)265-2215 or visit us on Facebook or our website at [ocast.ok.gov](http://ocast.ok.gov).

>> Research and development, technology transfer and commercialization, creating high paying jobs in Oklahoma is what OCAST is all about. This is *Oklahoma Innovations* on the OCAST Radio Network.

[ Music ]

>> Welcome back to *Oklahoma Innovations*. Chad and I are coming to you from WBT Open Innovation Forum feature, focusing on unmanned aerial systems, and our next guest has been on our program a number of times and talking about this particular subject, Dr. Stephen McKeever.

>> Dr. McKeever, and I should say Secretary McKeever, as well. Dr. McKeever's now the Secretary of Science and Technology.

>> Absolutely.

>> Of Oklahoma. Lot of good things going on in the state of Oklahoma. We're excited to talk about them. Gary, on the first half of the show, we heard about some of the great things that are happening here at Oklahoma State University.

>> Right.

>> Specifically, in some of the technologies coming out of the university. But Secretary McKeever, if you could tell us, what's going on just, generally, in Oklahoma and some of the great things as far as unmanned aerial systems and, really, just unmanned systems in general?

>> It's quite an exciting time, Chad. The industry is really beginning to get itself organized. We're looking very carefully at what the FAA are doing with regard to the regulations and rules under which the industry will be able to operate. And, so, the commerce side of this industry is really beginning to flourish, beginning to take off, pardon the pun. Within Oklahoma, we've been looking very carefully at the various advantages and assets that we have here and taking advantage of those. For example, we have, of course, at OU, one of the nation's leading weather research centers, alongside the National Weather Service and the National Severe Storms Lab. Here at OSU, we have one of the nation's leading engineering programs for both our and the research and development, and, so, when you marry those two, which you have, is a world leading asset in the use of UAS, unmanned aerial systems, to investigate the weather. And heaven knows, we have weather.

>> Oh, yeah. All kinds of weather. Yes.

[ Laughs ]

>> So, we are, in fact, in a perfect location to develop all of this. We have the geography, we have the climate, we have the weather expertise, and we have the UAS expertise. Other examples of nationwide, and in Oklahoma, will include the agriculture industry where these technologies will enable farmers to look after their crops in a way that hasn't been possible before using robotic command aerial systems to survey the crops to determine where extra nutrients, perhaps,

are needed or insecticides, herbicides, or water. And to do it on a scale that is really fine, so within a few square meters, rather than having to look at the whole field. Additionally, of course, we are a very heavy oil and gas state, energy. And, so, UAS is finding applications within the state to examine the, perhaps, the oil and gas pipelines, to examine the refineries, to look at flare stacks. Not in oil and gas but in still in energy, wind energy, looking at the wind generators and inspecting them without having to send a person up. And in the utility industry, inspecting the utility lines, distribution lines, and power lines. So there's a lot going on, and all of this is at protocommmercial stage and heavily into research and development.

>> What's the potential of Oklahoma becoming a leading state in the manufacturing of the technologies?

>> That's growing too. A number of years ago, when we first started the UAS Council, that's the Governor's Unmanned Aerial Systems Advisory Council, we surveyed how many companies in Oklahoma were active in the UAS space. There was just a handful. But, now, just three years later, it's well over 20.

>> Wow.

>> So it's growing quickly. Now, most of the major vehicles, the large ones that you see on the news, builds in places like California. It's not of out of reach that we could attract some of that industry here, but that's not imminent. It's not on the immediate forecast, but smaller manufacturers, that's entirely different. Out of those 20 plus companies, a good half dozen of them are manufacturers of these small vehicles, they're small companies. But, eventually, they will grow.

>> I know when we first interviewed Secretary McKeever, Chad, we had, always as we do a lot of our guests, we asked his vision in the next three to five years. Are we ahead of that scope from when we first started talking about this a few years ago or are on track, do you think?

>> I would say we're on track. I would say the industry, as a whole, is perhaps ahead, and we're

>> Really?

>> On track with that industry. So, in some senses, yes, you can say the state is ahead of its projections from a number of years ago because things have been happening so quickly.

>> Yeah.

>> But we're on track with the rest of the nation. We're certainly keeping up.

>> Secretary McKeever, while we have you on here today, I would be remissive if we didn't talk about some of the concerns that we hear from the public, and, certainly, there has been some media frenzy whipped up about improper and irresponsible drone flight, I'll use the D word, but the reality is, industry-wise in the commercial application, that's not exactly the case. It's a fairly heavily regulated industry, I assume.

>> It's a heavily regulated industry. That's right. And the industry, the commercial sector are extremely responsible with the way that they operate. They have to operate within regulations, within the rules, because their business is at stake. What we're hearing are, I would call them rogue flights, from individuals, not companies.

>> Right.

>> That are flying outside existing regulations. It's not a case that we need more regulations. They are already flying outside those regulations. They're already breaking the rules. So simply having more rules for them to break won't really make much effect. What we perhaps need is better enforcement, maybe heavier fine. But new regulations are not what we need. The commercial side are as dismayed, if not more so, with this growing number of rogue flights because it effects their business, it effects their reputations. What we have to do is avoid a knee-jerk reaction with more laws on top of the existing laws.

>> Sure.

>> That will simply be broken as the existing laws have been broken.

>> Sure.

>> Shifting gears a just little bit. When we're talking about unmanned aerial systems, they really are systems. So one part of it is the part we think about that is actually the vehicle itself, and there's a lot of research that occurs here. But what these vehicles carry are pretty amazing, and Oklahoma plays a pretty big role in developing some of the sensors, the sensing equipment, the radar equipment. Could you talk a little bit about that?

>> Yes. You'll hear people say that it's not the drone. It's what the drone's carrying.

>> That's right.

>> And, in many respects, that is, of course, perfectly correct. Excuse me.

>> That's okay.

>> The vehicle, itself, depending on the size, can carry payloads of a few pounds, normally, those are some kind of camera. In addition, as the payload goes up, the vehicle sides has to go up to accommodate it, and so they can carry electro optical infra-red sensing devices. They can carry chemical devices, for example, for looking for pollution plumes and mapping them without sending somebody into that plume. You just fly a vehicle through it. These are some of the examples. You mentioned radar. The radar development is really interesting. Most radar systems are far too large to be carried by these small unmanned vehicles, but the large end of the UAS spectrum, that is the MQ-9's are the predators, as we know them more popularly. They do carry on board radars that are really, very sophisticated. And, now, people are looking at developing radar systems that will enable these vehicles always to avoid other vehicles, particularly, manned aircraft.

>> Wow.

>> So it's quite a technological race that's going on out there.

>> Well, we are certainly thrilled that you're getting to see all of this and being Secretary of Science and Technology, I'm sure you're all over the state getting to see a lot of things in the works, and it's got to be a lot of fun.

>> And, really, being an advocate for.

>> Absolutely.

>> That plays an important role in that regard.

>> Absolutely. Absolutely. We want to thank you so much. You're always a delight to have on the program. You always have a lot of wonderful things to say about what's going on in the state

of Oklahoma, and it's always a thrill to have you on as our guest when we're at these conferences. We've got to take a little break. We have one more segment to go. When we return, we're going to come back and talk more about all of this wonderful, unmanned aerial systems technology on *Oklahoma Innovations*, so stay with us.

[ Music ]

>> This is one of the longest running weekend radio talk shows in America. *Oklahoma Innovations* on the OCAST Radio Network.

>> As a police officer, one of the most dangerous parts of my job is arriving on a scene where an armed suspect has barricaded himself or where we suspect some type of booby trap. We're most vulnerable when we don't know what kind of explosives or weapons are on the other side. It can be deadly.

>> Tactical Electronics, an Oklahoma-based company, invents, manufactures, and sells tools such as under door cameras and video fiberscopes scopes that are used by law enforcement officers, military, and counterterrorism personnel around the globe. The tools allow areas and packages to be inspected from a safe distance, which reduces the risk of injuries and death. With the support of OCAST, the company is developing image recognition software that scans packages and, within milliseconds, identifies what's inside. OCAST is advancing science and technology that not only improves, but also saves lives. For more information, call OCAST toll free at (866)265-2215 or visit us on Facebook or our website at [ocast.ok.gov](http://ocast.ok.gov).

[ Music ]

>> Welcome back to *Oklahoma Innovations*. We're coming to you from the Unmanned Aerial Systems Open Innovation Forum in Stillwater, Oklahoma at OSU. Our next guest now is with The Padina Group.

>> That's correct, sir.

>> And John Walker. John, welcome to the program. You're one of the speakers today. Tell us a little about yourself. You're headquarters, looks like in Lancaster, Pennsylvania, is that right?

>> That's correct. I live with the Amish folks, and my wife is Mennonite, and

>> Okay.

>> I spent 36 years with the federal government, mostly with the Federal Aviation Administration. I spent a lot of years in New York City, and my last job was as the director of airspace for the FAA. So I have responsibility for all the airspace in the United States.

>> Well, there's a lot of media coverage, Chad, and I talked about this early on, about all the concerns about regulations and how all of these unmanned aerial systems are going to be regulated, particularly, when it comes to the public, I guess, but you probably have a broader picture and give us an idea of what your topic was when you spoke today.

>> Well, sure. But, also, look at what happened in Kitty Hawk in 1903. There was no regulation.

>> Yeah. That's true.

>> So we have a new Kitty Hawk situation right now.

>> I guess that's a good way to label it. Yeah.

>> Absolutely, and it's global right now. And it's transformational, and it will effect everybody in, not only the United States, but the world, and I could talk about that in a second. The key thing is that you're right. It's regulation. How to safely incorporate unmanned aircraft systems into the safest airspace there is in the world today.

>> Right. Right. Well, especially, with the airlines. We hear about it in the news all the time. And, you know, I mean, I think it's even more of a concern than flying birds. It seems like we've heard a lot about that. So, what's the picture here? Lay it out for us.

>> Well, so the key thing is taking a new technology and how to birth that into commercial use. There's a difference between commercial use, and what I read today about expecting 1 million UAS's, drones, to be under Christmas trees this year around the world.

>> Wow. Really?

>> And what we have now is a phenomena that where that drone coming to a private house, how many people are going to get the instructions out and see, how do I use this properly? So I think there needs to be a separation between the hobbyists and how industry can, effectively, through the software adjustments, insure that a hobby UAS, or drone, does not go above a certain altitude or a certain distance left and right and really birth the commercial market, and that's where the advantage will be.

>> Interesting.

>> Now, John tell us a little bit about -- I have a radio controlled helicopter myself. I had a radio controlled airplane growing, all as a child, never considered myself a drone or threat to security or anything like that. What are some of the things, you mentioned certain altitudes, to fly these, what are some things that folks that do get one of these 1 million drones this Christmas can do to be safe and avoid some of these controversy that is we've had?

>> Well, the first thing is to know what you have as far as how to use it. Read the instructions. Secondly, the FAA has a very good program now, it's called "Know Before You Fly." And I think that that is something that anybody listening, if they or a friend or a family member has an unmanned aircraft to fly, go to the FAA website, Know Before You Fly, as far as what to do because the key thing goes back into how do we have a commercial market that's going to bring benefit to mankind, and that's probably going to be your next question.

>> Sure. Sure.

>> Well, tell us about that.

>> So, I think, I think one of the big things in support for the heartland of America, going from North Dakota down through, well, South Dakota, Nebraska, Kansas, Oklahoma, and Texas is agriculture. The fact that we have 7.2 billion people on earth now, growing about ten billion, how are we going to feed folks? And agriculture, believe it or not, is one of the key benefits of unmanned aircraft. Knowing what water to give. When to give the water. What nutrients to give. Where there's disease in crop. Already, we're finding the Ag Program, it's not only using UAS's as far as to do that, but they're incorporating unmanned aircraft into how we grow and manage our farm equipment. And that's a huge benefit for folks in Oklahoma.

>> Are these commercial applications, these companies, start-up companies that are helping agricultural business, do the monitoring or are those farmers and ranchers who are already in the

Ag business, are they buying the equipment and learning how to use the equipment for themselves? How is this all working?

>> Both.

>> Really?

>> You're finding big Ag companies, like John Deere and other companies, that are incorporating a system of systems for agriculture as far as providing information directly from the unmanned aircraft to the tractor to what has to be done to individual farmers, ranchers, who want to know where their heads of cattle are, their sheep.

>> Yeah.

>> How to do counts, and, of course, it goes back to the key thing of regulation. How to do it safely.

>> Absolutely. And, Gary, one of the things that we've talk about here in Oklahoma, certainly has been a concern to Oklahomans, is farmers not being the last generation of farmers, right? So their children come back and work on the farm. And I've heard, and, John, I don't know if you've heard this as well, but us living in the heartland that the adoption of UAS technology of some of the GPS guide technology is actually siding the kids that are growing up on the farm and they wanted to come back because it's the new way to do things. So I think UAS is building a better society in that way, and in, actually, as you talked about the detection of crops. Tell us a little bit about what are, what's next in UAS regulation, or maybe in another way to ask that is how are both civilians and hobbyist drones going to get along with airports?

>> Well, the key thing is -- that's a great question. The key thing is going to be the interface between in the United States, the FAA, and this whole notion of hobbyist's verses commercial. Congress was very clear in the FAA 2012 Reauthorization Act as far as how to treat hobbyists. Section 336 of that is very, very clear. Section 333 of that said, no, we have to have business able to use UAS. So, I believe, when Congress comes back and looks at this for the next reauthorization for the FAA, we need to have a little more clarity as far as the hobbyist verses the Industry. I was in Japan recently this past year when a small UAS landed on top of the Prime Minister's office building with radioactive water.

>> Wow.

>> So that is another key issue is the security.

>> Sure.

>> And taking nothing away from hobbyists, but I really believe we need to have a clear understanding of the capabilities of a hobbyist, and, again, that doesn't mean that they cannot get a license, like a pilot's license, to do other things.

>> What are you hearing in homeland security on this issue? I mean, because there has been some concerns, and we've heard these on talk shows and on. News about, you know, the potential for terrorists to have access to this technology and use it against us. Are you hearing anything about that in Washington?

>> Not really. However, other than it's clear that there are individuals in this dangerous world now who'd want to do bad things, and we need to guard against that, likewise, I said in my comments today, we're a nation still at war. And so much

>> Right

>> Of this technology's going for the war fighter and for our security. It's a key issue as we're seeing in New York at the United Nations right now.

>> Sounds like the FAA is really trying to struggle in finding a regulation balance between hobbyists and the commercial sector. Does that sound right? In other words, when you talked about regulation as far as -- we've talk about what hobbyist can do as far as flight elevation verses commercial because commercial obviously their airspace is going to be used much wider than the average hobbyist because most hobbyist are going to fly in their neighborhoods, in and around their parks and those kinds of things, where commercial UAS system, they're going to be used on a broad specter as far as coverage area, territory, and those kinds of things, right?

>> Well, absolutely. And the key thing though is safety.

>> Right.

>> That the mission of the FAA is safety, and I don't speak for the FAA.

>> Right.

>> Right now, however, I believe the FAA is doing a yeoman's job by identifying what the needs are. There's a brand new head, a senior executive of the integration office in FAA, reporting to the Head of Safety. There's an advisor to the Deputy Administrator. There's a tremendous amount of activity in the international world for ICAO, which is the International Civil Aviation Organization, with a UAS panel right now.

>> Interesting.

>> Great. Well, John, we got about a minute left of the show, tell us a little bit, just a little bit more about your company, The Padina Group. What you guys do. Do you work all over the U.S.? All over the world? Tell us a little bit about yourself.

>> Well, thanks. So, my business partner's here. His name is Mike Gallagher from Granbury, Texas, and I'm from Lancaster. We both are senior executives, retired from FAA, with a global company helping in certification and to advance this revolution of this new Kitty Hawk called unmanned aircraft systems.

[ Laughs ]

>> I love his analogy. That's really cool.

>> Absolutely.

>> Well, I'll tell you, I think all the stories we've heard today: Where technology going, the evolution of manufacturing of these devices, how the wide use of the devices is just incredible. And Oklahoma certainly working hard to be one of the main states that in the development of these technologies in the applications being used and OSU is really in the heartbeat of it all.

>> Yeah. Gary, I mean, I think you kind of saw it from beginning and end. We talked about Ben Loh who developed the Atlas at the time. He's now Dr. Ben Loh, he graduated, PhD, all the way to the financing of the project, the manufacturing project, and, now, all the way to the regulation of that final product as it enters the airspace. So a lot of great information that came out of the forum today.

>> And John Walker, thank you for being our last guest on this show, and to our listeners, thank you very much for tuning in this weekend. We hope to have you join us another time for another edition of *Oklahoma Innovations*. Have a great week.

[ Music ]

>> You've been listening to *Oklahoma Innovations*, brought to you by OCAST, the Oklahoma Center for the Advancement of Science and Technology. You can hear repeat broadcasts of other OCAST radio programs on our website at [ocast.ok.gov](http://ocast.ok.gov). Just click the News Media link. Join us at the same time next week and discover how Oklahoma's investment in science and technology is building a better economy and a brighter future for all Oklahomans. This program is a production of the OCAST Radio Network.