

# 2019

## COMMERCIAL DRONE REPORT



**COLIN  
GUINN**

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## **STATE OF THE INDUSTRY**

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Thank you very much for taking the time to read through our 2019 Guinn Partners commercial drone industry e-book. Besides the time we already spent researching the progress being made by the top companies in the commercial drone space for our clients, we've done a major deep dive into the value being created by these flying robots for large enterprises around the world. We wanted to expand our focus this time around beyond just what the top companies are developing and really deep dive into the market side to see what customers and what verticals are finding value in drones, how they are scaling their drone operations, and how they see this tech fitting into their business operations in the next few years.

This e-book is filled with in-depth interviews from not only the top companies in the drone space today, but more importantly, from large organizations that have spent the last several years evaluating how drone technology can provide ROI for their organizations.

With the progress happening in the regulatory space (including the FAA's recent BAA), and corporations establishing scalable processes to implement drones into their workflows, we can confidently say that the next several years look very good for the commercial drone industry!

We hope you will find value and enjoyment reading through our past year's worth of research!

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# SEC. 1

CUSTOMER STORIES

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NOT JUST DRONES  
**FULL STACK  
SOLUTIONS  
FOR INDUSTRY**  
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# OREN SCHAUBLE



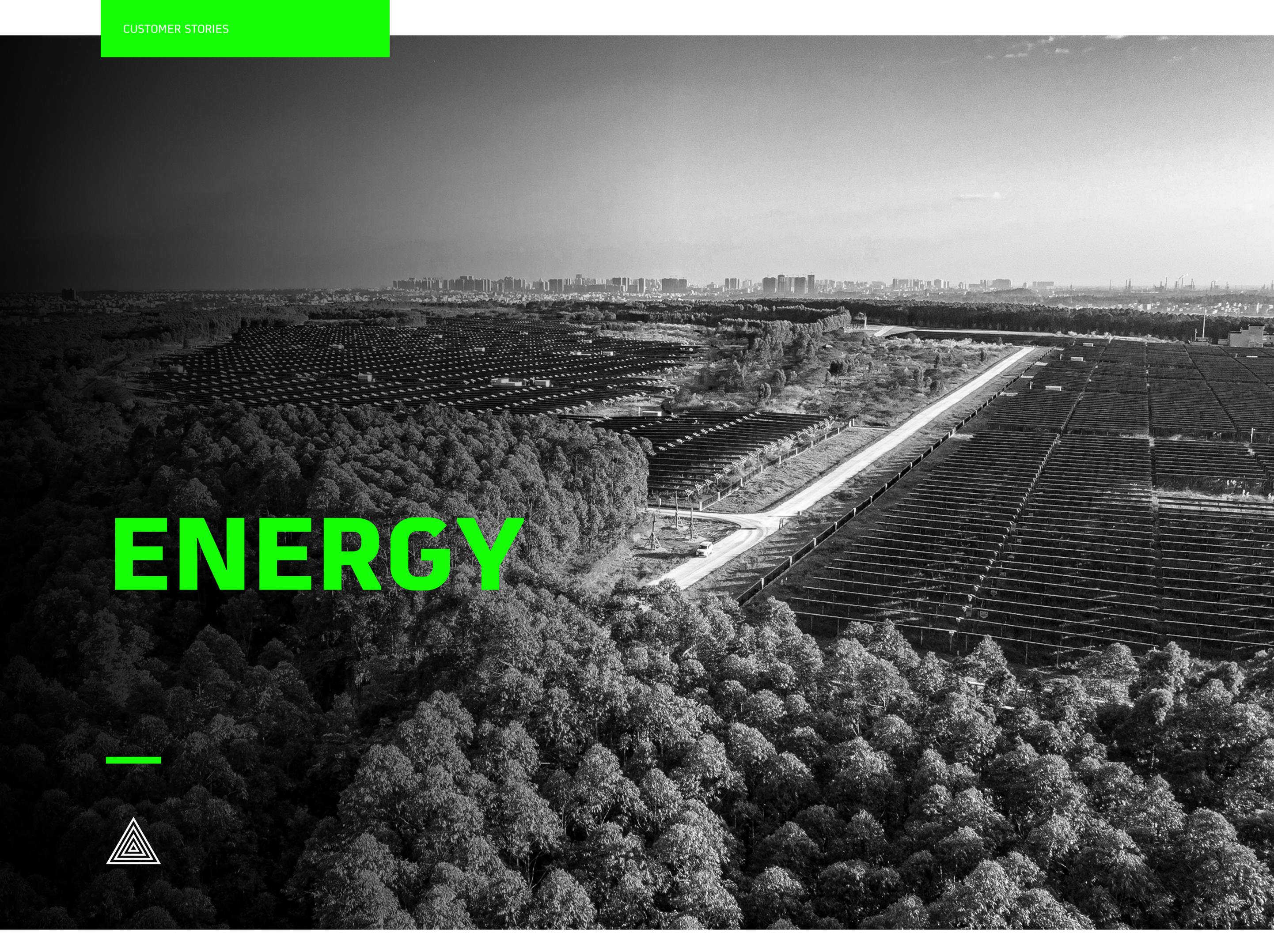
In the drone technology world, development of solutions for industries has proven a complex task. While the universal solution of an “eye in the sky” is helpful, modern companies engaged in digital transformation have much more complex data needs than just recorded drone video, and over the last few years there has been a significant gap between the full stack customer solution available and specific technologies desired to help solve customer problems.

To illustrate this issue, let’s consider the concept of the full stack solution. For any technology company developing a drone, software for a drone, or a sensor, they must first realize they are just one part of the stack, and the customer doesn’t want only that one part, they want a complete solution that ultimately delivers an information product. They want to buy the end insights and data results, with the easiest proven package to get them there. Having to choose a drone, a software suite, and a sensor, then look at logistics platforms and a handful of other apps or analytics algorithms is a complex purchase cycle. This complication is compounded by the need for licensing and regulation around drone use, and also by the lack of sophisticated software solutions that actually help users solve the problems they are facing.

2018 and early 2019 are the years when these software solutions have actually become mature enough to realistically use. These have come from industry veterans (it’s a young industry, so there’s some flexibility there) having spent enough time with real clients working to understand their needs and what it takes to sell to them, and having actually executed some of these cycles to fruition. Now companies have developed full stack solutions in construction, inspection, agriculture, security and more that are truly useful, and that have thought through all of the elements of the user experience. We have reached the “commercial minimum viable product” threshold and the results can be seen by the impressive enterprise sales being captured by companies like PrecisionHawk, DroneDeploy, DroneBase, Skycatch, Percepto, and Hangar

The next stage is going to be a painful one - scale. Software and data pipelines need to scale, but so do logistics - and growing inside of construction, energy, industrial, and agricultural enterprises takes documentation, process, time, and ROI history. True drone industry scale is going to take an extensive multi-year logistics push by companies who know process, know their customer, and have enterprise sales expertise, all in parallel with regulatory evolution.

# ENERGY





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# DEUTSCHE TELEKOM

(TELECOM)

Can you tell us a little bit more about your background in the industry? How did you stumble across drones and their benefits to your work and research?

Well, as a Telco strategist, I always focus on three targets, which are actually pretty rare:

- 1** | Is there an uncovered physical space, which is as of today not connected, and could be valuable in the future? Might there be areas, whole countries, or in this case the airspace?
- 2** | Are there new types of devices which today are unconnected but would benefit from an IP connection?
- 3** | Are there any differentiators making the network not just a pure bitpipe but a real value add for the customer?

Roughly two years ago, when talking to the German ANSP DFS it became crystal clear to me that "UAS" or drones are a perfect match to all three targets for these reasons:

- 1** | Lower airspace can be considered an uncovered area (and mobile networks are not designed to serve it even if there is already acceptable coverage).
- 2** | Drones are the "palm pilots/ Apple Newtons" of the 21st century - highly intelligent, but 'offline" and thus not delivering their full potential.
- 3** | Connectivity doesn't just matter with drones - there are many systems with a need to align and differentiate with the network, such as UTM, analytics, C2, etc.





## What roles and tasks do you currently use drone technology for?

My key focus is to show the benefit of networked solutions for many different purposes. With SIM modules on board you can:

1. Make drones visible on the radar of the ANSPs (or UTM Systems)
2. Fly beyond visual line of sight (BVLOS), substituting the remote control with a network that means you can steer a drone basically from any place to any place.
3. Transfer payload data from the drone in real time instead of waiting until the drone is grounded to read out its SD card.

Examples are:

1. Search and rescue missions where the drone is faster to the incident place than the mission commander in his vehicle on the ground. The drone can then deliver aerial pictures of the accident directly into the truck, where the commander can optimize his mission planning on the go. Moreover, the drone can analyze relevant information like scanning for injured people or identifying the composition of a fire.
2. Increasing the efficiency of civil drone operation like the inspection of power lines or pipelines. Without a network and its capabilities to enable operations beyond visual line of sight, you need to constantly move your pilots. We have run a trial over 15km of Autobahn construction in BVLoS mode from one place. Without BVLOS mode, you would have needed around 10 pilots or pilot movements to capture the same data once.

## What challenges have you encountered while implementing/utilizing this technology?

The policies in Germany are still pretty complicated. We have 24 local CCAs whom you need to get operations approved. Some are more advanced than others.

Additionally, we have experienced some challenging effects on our mobile network, especially when drones upload a massive amount of data while flying. To completely resolve this issue would mean to invest in a dedicated mobile infrastructure with a dedicated spectrum, which would probably cost billions of € and take a minimum of 10 years. This is not acceptable, and not needed in my opinion, as there are still not so many drones flying. So we have to find ways to manage them effectively with the infrastructure we have and optimize over the time with rising (drone) traffic. This is something we are used to in the mobile industry.

## What tasks do you perform manually today that could be fulfilled by autonomous robotics and UAVs in the future?

So far the use of drones in telecommunications is limited. You can do tower inspections, but they are still far more complicated than the current solutions. In my opinion, full autonomy will be only achieved in areas with extremely low air and ground risks. This might hold true for some agriculture use cases. In other cases, you will need a pilot as the final responsible person, even if this pilot has an automated job and is just "pressing the button".



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### **What are the benefits of being able to deploy drones daily or hourly?**

It will drive the development of standards and proper concepts of operations (conops) and lead to a higher level of trust/ faith in drones from a public perspective. It will raise the cost effectiveness of drone operations overall, thus driving the market.

### **What are some of the biggest success stories you can recall since having pursued drone technology?**

We created a lot of “wow effects” over the past two years. The most fascinating I always find are how unspectacular BVLOS missions are. You just see a drone starting and then it is gone and you hope it will find its way back safely. My personal biggest success was when I saw a “connected drone” in the situational awareness systems of an ANSP for the first time. This will be crucial for a proper and safe drone ecosystem in future.

### **Where do you find the most value from drones in your operations?**

First, in substituting or complementing helicopter operations. Second, all operations which have a latent need for an airborne solution but are so far too expensive to widely think of. Finally, I am sure the biggest value will come from constant aerial monitoring enabled by highly standardized flight operations in a fairly and safely integrated airspace.

### **What are your hopes for the future of this space?**

We need to overcome/blur the old silos of aviation and telecoms and drone manufacturers and IT operations and regulation to enable a market with huge benefits for society. I hope this technology will be mid term widely appreciated/accepted by public perception. That’s why it first should find its way into regular useful, and even life saving operations. Delivering pizzas by a drone is nice, but will not pave this way.

And then I am personally looking forward to the age of The Jetsons. I believe people will love air-taxis/eVTOLs as it makes drones as emotional as cars have been for decades and I hope they will come sooner rather than later.





## ASEL AYAPOVA

GLOBAL DRONE PROGRAM MANAGER



**Can you tell us a little bit more about your background in industry? How did you stumble across drones and their benefits to your work?**

I have worked with AES since 2011 as a certified project manager managing power plant construction projects. Since 2017, I have led the AES global drone program. AES Corporation is a Fortune 500 company that owns and operates electric generation and distribution services using coal, gas, thermal, solar, and wind in over 15 countries.

We have more than 100 power plants right now. Initially, AES starting using and testing new technology over different applications over the past 3-4 years. Their businesses globally started testing different technologies in more of an exploratory use of drones and in a very decentralized manner.

We have already recognized benefits in the power and utility industry because the industry has such high risks such as working in high temperature environments, for example. The most valuable objective for the team was improving safety.

Today, I conduct monthly global calls for each vertical, to which all members are invited. We discuss best practices and educate our global program on particular use cases.



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**How extensive is your current drone program? Are your operations solely internal, are you utilizing external resources such as partnerships/service providers, or a combination of both?**

At the end of 2016, the manager of AES decided to build and centralize the program and approach to create a very innovative, life changing, and mindset changing program. In order to make any changes in the business it takes lots of time and effort involving global communication and research. We asked ourselves: How can we improve safety, efficiency, and financial stability?

We then planned and strategized 3 major phases, the first being exploratory, testing, and evaluation of different applications for verticals such as solar, wind, and coal plants, which we finished in 2017. For each of these applications we developed over 120 different solutions globally. For example, in solar we have 21 use cases and in wind we have 13 use cases.

Phase 2 involves the implementation of new applications and the replacement of old methods. When they started scaling the program, they identified two directions for the development of the program, one being testimonials of use cases and the second being developing and training people to have certified in-house drone pilots globally.

In 2017, we had 60 drone pilots. Now, we have 175 drone pilots to assist in developing the internal program.

We have a mix of both organic and outsourced approaches.



Our in-house programs can be used for simple daily inspections. For more complex or high risk activities we will hire a third party drone service provider. To scale the program, we involved a partner in industry, Measure. We involved them first for exploratory testimonials and they visit our assets such as power plants to test different use cases and applications, and they confirmed what type of use cases are present. Not many power companies have mature drone programs. Our differentiation from other companies is that we are a global power company that is using all different types of applications in a centralized manner.

Measure also trained our pilots for different types of applications. We have two different types of training: basic and extensive. We use Measure to perform our extensive training and to purchase different types of drones. We are also testing different types of robotics.

Our AES divisions in South America, located in Chile and Brazil, are very advanced. They are researching and developing different technologies and extending their scope by looking at different solutions. They then educate in order to change mindsets.

Another very important step is to build program governance and procedures. This year we will be launching documents for standard operating procedures (SOPs).

We will be using all the data that we have captured from these inspections to brainstorm where to store, use, and systemize this information through AI in a safe, secure global cloud. We have also worked with Measure on this, which has hired a software company to aid in the integration of the captured information. We are looking into applications that enable us to see all flights globally, the time they took, the safety procedures they followed, etc.

### **What challenges have you encountered internally while implementing/utilizing this technology?**

This industry is a very fast moving industry coming up with new types of technologies every day. In order to be on trend, we are asking our global drone program - now in 15 countries with more than 500 people directly working within the program such as pilots, leaders, and drone champions - to stay informed and up-to-date with the changing and fast paced industry.

Regulations, legislation, and standards of different countries have been a challenge, because we are operating globally in each country. For example, in the US not many companies are using the newest technologies. In some countries like Vietnam and South America, they are just now starting to allow drone inspections. It's very important to keep up with all changes in regulations in each market in each country.

Mindset change is also very important. People are used to working in one method and to try and change the original method is often nearly impossible. Centralization helps push a change of mindset, but there should be internal motivation to explore new technologies without fear of losing their jobs, etc. This involves a lot of communication and stakeholder management.



### **What would be the benefits of being able to deploy drones daily or hourly?**

In solar, we have a high frequency of different types of inspections. One might be daily for overall safety, another might be for vegetation on a bi-weekly basis. Some inspections at coal and gas plants would be of benefit during outage periods. These could be especially beneficial in internal boiler inspections. We have 4-5 power plants globally where we inspect internal boilers with drones. Usually this is very costly, so we are eliminating scaffolding costs by performing a job that would take 45 people 4 days, saving a total of \$800,000.

### **How do you see automation and robotics impacting your business in 5 and 10 years? What cost benefits do you foresee?**

Let me answer that with an example. In December 2018, we invited Measure to fulfill drone inspections on one of our fields consisting of 14,200 solar panels because we noticed that 30% of those panels were underperforming. Previously, we had reached out to our Operations and Maintenance (O&M) partner, who only found 60 panels and 1 line of string not operating. Measure found 104 panels out of service and 86 strings of line, saving us a total of \$110,000. We see these kinds of examples growing in frequency and magnitude over time.

### **What are your hopes for the future of this space?**

We are waiting for legislative changes and we also see that AI will be a very important part of the future. We are working with Google on machine learning for wind farms and are capturing lots of historical data. A lot of this data should enable us to make better decisions and we'd like to have centralized reports of data for many years to come. We hope that people will be trained to learn to use new technology and we need more data analysts.





## RICHARD MURPHY

Senior Manager of  
Corporate Aviation Services



### How has automation improved your business process, scalability and efficiency?

UAS technology has not been embraced to the extent that it has had a significant impact in these areas although we have had several use cases with documented cost savings.

### How do you see this growing in the future?

I believe in the near future UAS will have a significant impact by mitigating risk to personnel (tall structures and confined spaces), decreasing down time through predictive asset management and more time efficient inspections, and cost savings for such things as scaffolding and rope access teams.

### What tasks do you perform manually today that could be fulfilled by autonomous robotics in the future?

Inspections of tank roofs, high structures, interiors of tanks and vessels, and volumetrics. Security, surveillance, and pipeline inspections will also be candidates for autonomous BVLOS flights.

### What are your hopes for the future of this space?

As we have become more comfortable with the technology, simple manual flight interior and exterior visual inspections are becoming more commonplace. Autonomous VLOS visual inspections will be next. As the technology proves itself in safety, reliability, and accuracy of results, it will be the go-to method of complex inspection, asset, site and conditions monitoring, and emergency response. Asset management will benefit greatly from cost effective, safe, reliable, and minimal down time inspections.





## TODD CHASE

Aviation Safety and  
Compliance Manager



### Can you tell us a little bit more about your background in industry? How did you stumble across drones and their benefits to your work?

I was a military pilot with the Coast Guard and the Air Force, and I started flying helicopters with the Coast Guard. Then I joined the Navy and was based in Miami for 5 years. I completed an exchange tour with the Navy and Pensacola, and was an instructor pilot for the Navy and then transitioned over to the Air Force to make a multi-engine reconnaissance plane and so I was able to fulfill lots of counter narcotics initiatives with that. Afterwards, I ended up operating a plane that was attached to an F16 at a base in Ellington Field, and the F16 cracked, so the mission was changed from a fighter phase to a reconnaissance phase. Leadership then convinced me to join the Predator phase, so I stopped flying the reconnaissance plane and for the last 5-6 years of my military career I fulfilled Predator missions. While I was the Chief of Safety - basically the HSC Director for the Ellington base - BP offered me a job in Houston and after 22 years in the military I accepted, which brought me into the oil and gas sector.

### Did you utilize any drones at BP at the time?

Different business units across the globe were dabbling in drone technology and BP Alaska started this initiative to fly a drone over a gravel pit with AeroVironment. This instance was the first commercial over-land operation of a UAV in the United States and the FAA was heavily involved. BP Alaska had asked for some support, and I was an Aviation Advisory and the only one with an operational background with the drones so the Head of Aviation asked me to write some guidelines for drone use within BP. Exxon, Shell, Conoco, and Chevron were working on similar standards and guidance at the time, so we started sharing some ideas and created a working group together, of which I was one of the founding members.

# SHELL

**How extensive is your current drone program? Are your operations solely internal, are you using external resources such as partnerships/service providers, or is it a combination of both?**

In the past, we have mostly used third party service and platform providers. We did start implementing our own programs at some of our plants and we will support and audit those programs. I then review the different programs to make sure they meet standards and help guide them to understand and meet the expectations of the guidelines and standards.

**What roles of your business currently use drone technology and for which tasks and use cases?**

We are currently utilizing drones for surveying, 3D modeling, laser scanning, methane detection, photogrammetry, general visual inspections, and security.

**What types of challenges are you currently facing in adopting new technology?**

A lot of times expectations have to be clearly communicated on the deliverables. Drone companies can be very aggressive selling and marketing their capabilities. However, when they go out and take some pictures, they often end up not being useful because there was a lack of understanding regarding expectations set.

**What tasks do you perform manually today that could be fulfilled by autonomous robotics in the future?**

Shell has utilized a 3rd party platform in the past with whom we completed a proof of concept of a "drone-in-the-box" application that performed autonomous inspections at various frequencies to simply test it out and it was extremely successful.

**What are your hopes for the future of this space?**

One of our big goals is to reduce the risk exposure of manned aviation over pipelines and implement drones to support the pipeline patrols and reduce our manned aviation risk.



# GREAT RIVER ENERGY

## KYLE GUSTOFSON

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Sr. Transmission Line  
Design Engineer/  
Transmission UAS  
Program Manager

### **Can you tell us a little bit more about your background in industry? How did you stumble across drones and their benefits to your work?**

My background is in Transmission Line Engineering. Our use of drones started with an interest group and has since grown into a UAS program. The development of our program has been driven by innovative employees from across our organization who identified ways that we could deploy drones to improve safety, increase cost savings/efficiencies, and capture better data or data that was not accessible without a drone.

### **What roles of your business currently use drone technology and for which tasks?**

Currently our Generation and Transmission groups are using drone technology to perform inspections, topographic mapping, and content creation. Specifically for inspections of stacks, upstream raise, plant overview, powerlines, wind towers, transmission insulators, and landfill compliance. The topographic uses include area, volume and gradient calculations for coal piles, environmental watershed, and ash ponds. For content creation uses, safety videos, advertising, and general imagery.

# GREAT RIVER ENERGY

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## **What types of challenges have you encountered internally while implementing/utilizing this technology?**

The challenges that we have come across pertain mostly to insurance questions, privacy concerns, and the rate at which the technology becomes outdated.

## **How has automation improved your business process, scalability and efficiency? How do you see this growing in the future?**

Currently we are not using automation beyond the automated flight control used for mapping projects. In the future, I think that automation will control how most, if not all, UAS will be used not only in our organization but across all utilities and maybe even across UAS across all industries. I think that automation will improve efficiency, decrease resources when scaling, and ultimately improve safety.

## **What tasks do you perform manually today that could be fulfilled by autonomous robotics in the future?**

I think that all of our drone and inspection tasks that we do manually today will be fulfilled by autonomous robotics in the future. Once the autonomous robotics can analyze the data that they capture I think that use of autonomous robotics overall will grow rapidly.

## **What are your hopes for the future of this space?**

My hopes are that we leverage and invest in this technology to capture the value that is available today and continue to push forward towards a goal of 100% autonomous inspection and analysis of our infrastructure.



# SURVEY





# SOUTHEASTERN SURVEY & MAPPING

## ANDREW HUNTER & PATRICK PHILLIPS

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**Can you tell us a little bit more about your background in industry? How did you stumble across drones and their benefits to your work?**

Andrew - I have been in surveying for probably about 6-7 years and that's how I got into it. We know quite a few people in industry who use drones and it led me that way. I also have some family members that deal a lot with drones and I got my part 107 and brought it to southeastern a year and a half ago.

Patrick - My father was a photogrammetrist and surveyor for the Army and Air Force and then I don't know how long for private industry. I used to help him in the place and he loaned me out to some of his surveyor friends. We have several employees that have drones and I won one in a raffle and brought it into work and started using it. With Andrew's experience and my enthusiasm, executives took interest in it.

**What roles of your business currently use drone technology and for which tasks? For what use cases?**

We're looking into other things but surveying and mapping are our main priority. We did figure out that we can do LiDAR scans for mines. We figured out doing things with a drone will be safer and quicker and it saves a lot of time and money overall, because if a pile is really large, the guys can't get on top of it and to get an accurate volume with the software we're using saves a lot of time.

GIS division has a mobile mapping vehicle, so we're taking imagery along corridors and if we were able to properly deploy a drone we could get even more perspectives.

# SOUTHEASTERN SURVEY & MAPPING

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Change detection for progress of mapping or construction projects is another use case. If you map construction along a driveway - and we go back time and time again - you could use that change detection to prove that we're not at fault and mitigate some of that risk.

We've used multi-spectral over acidic ponds and can sense temperature changes and detect leaks.

Inspection is something that's big as well, like many power companies use drones to inspect power lines.

## What types of challenges are you currently facing in adopting new technology?

We're gaining their trust and showing that it is precise, accurate, and safe. We're overcoming the image internally. We're not sure about external image, however. Our workers in the field don't need to stop their work to climb up a pile. We are overcoming access challenges since many of these piles and locations are hard to access. We can complete our job in an hour with a drone versus a week or two.

The draw back of some of this is you get the tops of the funnel and the tops of the grass, so we'd like to expand into multispectral so that we can look beyond canopy.

## What are your hopes for the future of this space?

We're looking for easier and quicker access. The FAA is loosening up on some of the rules. I'm hoping for better public image and acceptance.

I'd like to see more jobs come in that we can do so we can grow more and get better sensors, which would lead to an investment in larger drones, fixed wing, and sensors such as multispectral.

Damage assessment is a big thing. Several counties would like to have someone fly over the roads and drive the roads and assess the cleanup. When you fly multiple times, you can look at the progress of the cleanup, and everytime I drove down the roads there was debris in the roads which prevented us from capturing data efficiently. We could follow the cleanup crew, and see beyond where they need to stop.

Greater connectivity and information sharing.



# CONSTRUCTION



# BRASFIELD & GORRIE

## BLAKE POTTS

Regional VDC Manager

### **Can you tell us a little bit more about your background in industry? How did you stumble across drones and their benefits to your work?**

I began my career at Rogers-O'Brien Construction in Dallas, TX. In July of 2013, Rogers-O'Brien purchased its first drone - a DJI Phantom 1 - and we built the company's drone program from there. Almost immediately, our superintendents and project managers could see value in using drones on their job sites. When I left RO in 2017, we had twelve drones operating on our project sites throughout the state of Texas.

### **What roles of your business currently use drone technology and for which tasks? For what use cases?**

Documenting progress, QA/QC, and quantity take-off. It's extremely important to both our owners and B&G that we accurately document progress on our job sites. Drone technology gives us a real time window into the current state of each of our projects.

Capturing existing site conditions is another example of how drones are used at B&G. Using a software platform called DroneDeploy (DD), we create 3D maps of our job sites that allow us to quantify the earthwork that needs to be performed. Our estimators can perform cut/fill analyses from these 3D maps. We tie our drone maps to the real-world using survey data so that each point on our drone map matches a point in the real-world. This data can be handed over to our earthwork subcontractors and they can use it to perform extremely accurate grading.

### **What challenges have you encountered internally while implementing/ utilizing this technology?**

Establishing a corporate drone policy was our first goal. B&G is a large general contractor who operates in every state in the U.S, so it is imperative that we follow all federal and state regulations concerning drones. Safety, Risk Management, Legal, Accounting, Aviation, Innovation, IT, and Operations Departments were all a part of establishing the policy framework.

# BRASFIELD & GORRIE

## How has automation improved your business process, scalability and efficiency?

B&G uses a cloud-based drone mapping software called DroneDeploy (DD) to capture photographs of every job site. We perform the flight planning in DD and then the software does the heavy lifting from there. DD automates the flying of the drone as well as the data captured, so we are guaranteed accurate and repeatable results. This allows our pilots the ability to focus on safe operation of the drone and not just on flying it.

## What tasks do you perform manually today that could be fulfilled by autonomous robotics in the future?

Currently, software platforms like DroneDeploy automate the actual drone flights as well as the data captured, which is a huge time savings for us. With that said, a human must still be involved in drone flights for regulatory (FAA) reasons. In the coming years, I believe we will see the regulations soften as far as automation goes once the FAA and the drone industry have enough data from past flights to prove that drones are a safe technology. It is my belief that ultimately drones will be completely automated. They will require little to no human intervention to capture data. In construction, we will have drones "living" on our job sites that can take-off, capture data, land, and upload that data without the need for human interaction.

## What would be the benefits of being able to deploy drones daily or hourly?

This is dependent on the type, speed, and phase of the project. You should start with weekly flights and then perform more as necessary during phases of the project where things change rapidly. During the

installation of the exterior skin of the building, for example. I could see hourly flights being more useful for heavy civil contractors where the site is changing so rapidly that you would benefit from having maps that were updated multiple times a day. It becomes prohibitive to constantly have a drone pilot onsite flying the site. Once drones are autonomous, I think having a drone fly the site hourly will be the norm.

## What are some of the biggest success stories you can recall since having pursued drone technology?

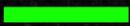
We have quite a few of these. The one that I keep coming back to is the story of the invisible trenches. It was early during the sitework portion of a project. We were capturing site conditions weekly using drones. Months after sitework was completed when one of our subcontractors hit us with a change order for additional trenching that had to be done to install underground utilities. This was a large project that was spread out over many acres so the change order was for nearly \$250k. One of our project managers pulled up all of the drone maps that we had produced each week and started verifying the additional trenching that was needed. The problem was that he couldn't find the trenches that we were being asked to pay for. We went back to our subcontractor and using the drone photos were able to talk through all of the additional trenching and saved the project \$250k. This was a case of miscommunication that was easy to solve with the drone photos.

## What are your hopes for the future of this space?

I really believe in the potential for drone technology to change our world. Advances in sensor technology and AI software will enable drones to operate safely with no human interaction. We've all heard about Amazon's plan to have drones deliver goods to customers, but that is just the tip of the iceberg. This technology has the potential to change the way we send and receive goods, increase our understanding of the world around us, and even how we travel. We've all joked about The Jetsons and how we were promised flying cars back in the 60's, but drone technology could finally deliver on that promise.



# AGRICULTURE



## AARON BREIMER

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General Manager

### **Can you tell us a little bit more about your background in industry? How did you stumble across drones and their benefits to your work and research?**

I grew up on a field crop farm in Ontario (corn, soybeans, wheat, dry beans). I went to the University of Guelph for H.Bs.(Agr.) including 1 semester on exchange to New Zealand and graduated in 2001. The first 10 years of my career was in Ag Retail selling seed, crop protection products and fertilizer and buying grain. I joined an agronomy consulting company in 2011, started experimenting with the value potential of drones in 2015, and from 2016-2018 worked with drone companies to add value through data insight analysis to their imagery and data capture. By 2018, the agronomy consulting company which has evolved more into precision ag consulting company was purchased by a drone services company to develop their analytical offerings.

### **What roles and tasks do you currently use drone technology for?**

1. Imagery acquisition – NDVI for nutrient and other plant stress directed scouting
2. Thermal imagery – modelling plant disease prediction
3. RGB imagery – data for AI solutions (weed and insect identification/quantification as well as plant population counting)
4. Imagery in general – being able to supply data to measure area of affected regions of different crops from stress or damage
5. Imagery for management decisions – field tiles, sensitive environmental issues, and livestock locating/counting

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### What challenges have you encountered while implementing/utilizing this technology?

1. Battery life of the drones to cover enough area.
2. Length of time to fly a single site with a single drone.
3. Imagery resolution.
4. Data transfer speed.
5. End users recognizing the value.
6. Confusion in the marketplace with poor customer followthrough and overpromising of other services including satellite imagery.

### What tasks do you perform manually today that could be fulfilled by autonomous robotics and UAVs in the future?

1. Weed ID/control.
2. Insect ID/control.
3. Fertility applications.
4. Crop planting – robotics if scaled down and used in swarms would reduce compaction.
5. Soil monitoring – nutrient and moisture content.

### What would be the benefits of being able to deploy drones daily or hourly?

1. Identifying issues in a more timely manner.
2. Managing issues from a zone level within a field instead of trying to manage the total variation of the field with a single approach.



### What are some of the biggest success stories you can recall since having pursued drone technology?

1. Variable rate nitrogen in corn and wheat from NDVI imagery.
2. Selective fungicide spraying in dry beans from NDVI imagery.
3. Weed and foreign material detection using AI that analyzes RGB imagery from drones.

### Where do you find the most value from drones in your operations?

1. Being able to complement our existing services around creating value from data analysis/insights.
2. Being able to offer solutions to customers that are cutting edge.
3. Being able to create deliverables from data that generate additional revenue.

### What are your hopes for the future of this space?

1. Development and implementation of swarm technology for both drones and autonomous robotics.
2. Solutions around battery limitations.
3. More quantifiable value to the end users.





## NEILL NEWTON

Sr. Product Application  
Specialist Technology &  
Engineering

### **Can you tell us a little bit more about your background in industry? How did you stumble across drones and their benefits to your work?**

I am a Bio and Ag Engineer by training with both undergraduate and graduate degrees from North Carolina State University. I grew up and am still active in the family row crop farm in SE NC. Agriculture is my passion and finding ways to move agriculture forward through new technologies in these trying times is something that I really enjoy. I am an Application Specialist with Syngenta Crop Protection and have an interest in precision ag and precision application. A key priority for us as Application Specialists is the stewardship of Syngenta brands in the field, which includes enabling our customers to use these products in a safe, efficacious manner. The ability to make applications by Unmanned Aerial Vehicles (UAV's) is not a new technology, in fact it has been around for many years starting with the remote controlled helicopters (RCH), popular in Japan and Korea. Drone companies like DJI and X-aircraft have really made an impact on this market in the last 3 years making more affordable, smaller, lightweight aircraft more suitable for the smallholder farms primarily in Asia. Due to labor shortages and drastically improved work rates, these drones have become extremely popular in these countries. For this reason, Syngenta products are being sprayed through these aircrafts and we have an obligation to ensure that the applications of our products are being done right.



**How extensive is your current drone program? Are your operations solely internal, are you using external resources such as partnerships/service providers, or is it a combination of both?**

Our drone program is rapidly growing along with the market and involving more and more groups, both internally and externally. Syngenta is not in the business of providing application services, rather providing solutions in the form of agricultural chemicals which can meet the end users' expectations through a variety of application systems.

**What challenges have you encountered internally while implementing/utilizing this technology?**

The biggest challenges, from my perspective, are lack of data paired with rapid adoption and little regulation (country specific).

**What would be the benefits of being able to deploy drones daily or hourly and instantly on demand?**

I think that there is still a lot that the agriculture industry needs to learn about drones. From understanding their capabilities in Ag to applying them in the most safe and efficient way possible. Regulators are lagging behind the consumer in that there are two extremes - either little to no regulations or strict regulations against the use of drones for application purposes simply because of the unknown.

**How do you see automation and robotics impacting your business in 5 and 10 years?**

It is obvious that robotics and automation will become more and more popular in the Ag industry. Syngenta has been on the forefront of this movement and is in a great position to provide our customers with quality products that fit these new technologies.

**What are some of the biggest success stories you can recall since having pursued drone technology?**

I think the biggest success stories around drone technology are the adoption rates in Asian countries; giving them the ability to overcome labor shortages and drastically improve their work rate. This opens a door for Ag Chem companies to step up and provide the right solutions that fit these new application systems.

**What are your hopes for the future of this space?**

My hope for the future of this space is that drones will continue to have a place in the Ag Industry. There are lots of obstacles that need to be dealt with to maintain this position and safety - both airspace safety and human/environmental safety - should be the number one objective. All industries will have to come together to guide regulators in the right direction as well as ensure that end users have the knowledge necessary to safely carry out their missions.





# NDSU

## JOHN NOWATZKI

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Agricultural Machine  
Systems Specialist

### **Can you tell us a little bit more about your background?**

I am an Extension Agricultural Machine Systems Specialist at North Dakota State University. I coordinate the NDSU Extension agricultural machinery systems educational program. Subject matter areas include agricultural machinery, precision agriculture, agricultural chemical application technology, and UAS and remote monitoring applications to farming. I regularly deliver educational presentations on various precision agriculture topics including farm data management, unmanned aircraft systems (UAS), LiDAR applications, and variable rate fertilization of field crops. I also conduct applied research collaboration with other NDSU faculty. Recent research topics include UAS applications for agriculture, variable rate fertilization, optical sensors for in-season fertilization, and soil compaction. I am a principal coordinator for the annual Precision Ag Summit in Jamestown.

### **What roles in agriculture do you currently use drone technology and for which tasks?**

Remote sensing of agricultural crop and livestock management. We use the imagery for the following applications:

1. Plant Emergence and Stand Count
2. Weed Identification and Infestation
3. Herbicide-resistant Weed Identification
4. Crop Monitoring
5. Nutrient Deficiencies
6. Yield Prediction
7. Crop Senescence
8. Moisture Stress in Crops
9. Monitor Livestock Body Temperature

## **What challenges have you and companies in the sector encountered while implementing/utilizing this technology?**

Restrictions of not being able to fly beyond visual line of sight. Processing and managing the large quantities of data from collecting imagery over large areas.

## **What tasks do you perform manually today that could be fulfilled by autonomous robotics and UAVs in the future?**

1. Weed control in fields.
2. Insect monitoring and control in field crops.
3. Livestock handling on rangeland.
4. Crop health monitoring.
5. Livestock inventory on rangeland pastures.

## **What would be the benefits of being able to deploy drones daily or hourly?**

1. Increased efficiency of monitoring crops and livestock.
2. Less labor time required to monitor crops and livestock.
3. Herbicide applications to control weeds on rangeland.

## **What are some of the biggest success stories you can recall since having pursued drone technology?**

1. Weed identification in crop fields.
2. Herbicide-resistant weed identification in crop fields.
3. Identifying and quantifying weather damage in crop fields.

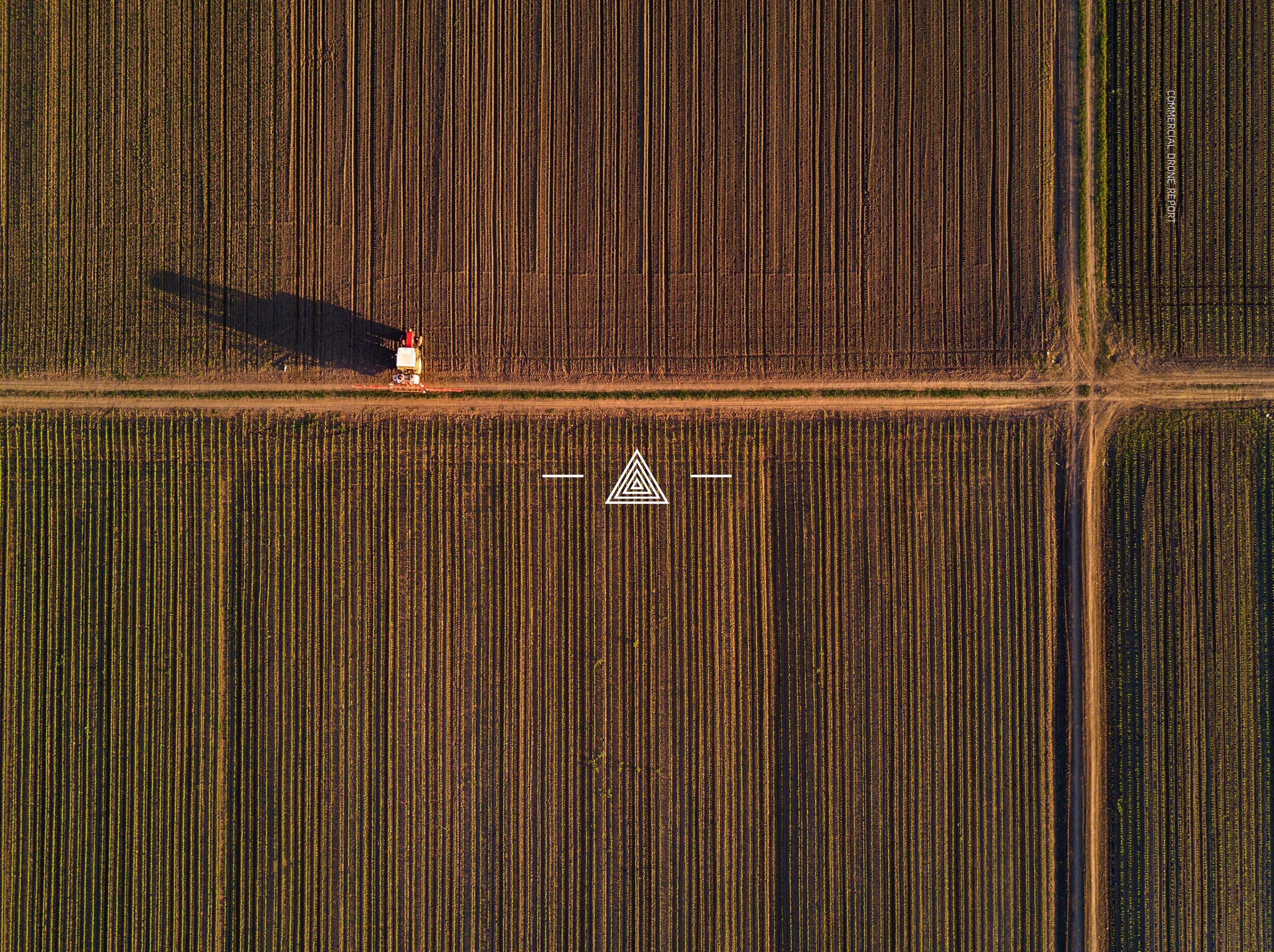
## **What are your hopes for the future of this space?**

1. Change of regulations to allow drone operation beyond visual line of sight.
2. Real-time data management for crop management.









# SEC.

A GAME OF PLATFORMS



**We see the drone industry shifting into competing full stack solutions for each commercial market segment, with multiple companies stitching together hardware, software, analytics, and workflows specific to commercial requirements. DJI is the focal point of many of these solutions, and we classify the rest of hardware providers all in relation to DJI and their market dominance. Platforms are either DJI Competitive (FLIR/Aerovironment) or DJI Enabled (DroneDeploy/PrecisionHawk), and in some cases a combination (Parrot Commercial, whose sensors and software leverage DJI, but whose hardware is directly competitive).**

**FLIR has been purchasing hardware platforms to integrate with their sensor technology and has rapidly become the go-to player for government SaaS to complement their sensor business. They are now a direct hardware competitor to DJI with purchases of Aeryon and Pros Dynamics (who make the Black Hornet).**

**Aerovironment is developing and acquiring new hardware and software for closed systems and expanding from government into commercial with robust technology, government experience, and credibility behind them.**

**Parrot owns a broad hardware stack (Parrot drones, Sensefly drones, Micasense sensors), and industry leading software (Pix4d). It has platform tools and vision but has not put it all together yet into a successful adopted commercial platform.**

**DroneDeploy is the software technology leader with a large, successful app marketplace. They are dependent on the DJI platform and adding services offerings to help with enterprise scaling.**

**PrecisionHawk is the major services player, industry sales leader, and lead technology integrator for inspection. They leverage DJI platforms and other systems, have acquired multiple smaller services players, and have developed a competitive foothold in BVLOS in the US.**

**We interview two of the leading platforms here to look at their customer ROI and vision for the future.**





An interview with Mike Winn CEO

## How does your company provide value to customers today? How has that changed over the last few years?

DroneDeploy makes drone software that helps businesses manage complex job sites. Our software automates everything from flight to insight, allowing teams to survey large areas and make informed decisions quickly, safely, and accurately.

We're making drone data accessible and useful across all industries, improving site communications, planning, and operations.

DroneDeploy's software continues to grow with feedback from our customers, recently extending beyond mapping to panoramas, videos, and inspections solutions. And backing all this with our enterprise drone management platform that's ISO27001 certified--the gold standard in our industry for security.

We are the leading drone software company with over 4,000 customers that have flown over 1 million flights across 180 countries, including many of the world's largest companies.

## What industries does your solution concentrate on?

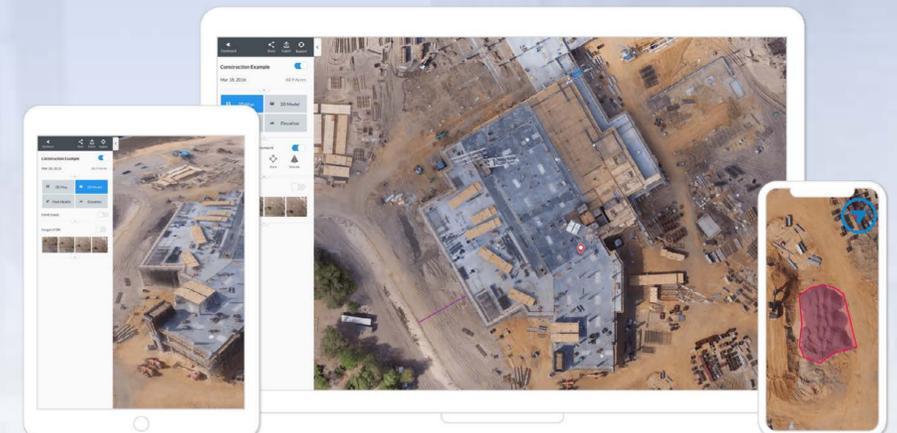
DroneDeploy is best known for our leadership in construction and agriculture, and we're seeing major growth in the energy and mining sectors.

What we've found is that our largest customers are looking for a complete enterprise drone solution that enables use across multiple use cases. Across all industries, our customers benefit from cm-level accurate data, produced quickly and simply.

In particular in construction and energy, our customers benefit from the industry's highest quality 3D models and maps that they compare to plans, allowing them to collaborate across entire teams.

In agriculture, we help the world's largest drone fleets leverage real-time maps of row-crops through a feature called live map.

And in mining, we've recently launched a set of tools including AI driven stockpile detection, reporting, and automated cut/fill.





## Where do customers find ROI in your solution?

DroneDeploy helps our customers make better decisions faster. First, our software provides on-device image processing which allows for the capture of truly real time data. Second, our platforms are cloud-based, allowing for collaboration with our users. And third, our products are ISO-certified, providing the highest level of data security for businesses of all sizes.

## Do you have any concrete examples of ROI you can share?

Here are some customer success stories



**ROI in Construction:  
McCarthy Construction**



**Oil & Gas  
Pipeline Leak Detection**



**Drones for a precision  
agriculture program at Bowles**

## What do you think will be most different in the commercial drone space in 24 months?

True enterprise scale.

We're transitioning from a world where our customers had dozens of drones to hundreds. In the next 24 months, we'll have our first customer operating 1,000 drones.

To do this, the software industry will need to provide full solutions that scale. That means full workflows, where drone flight, compliance, integrations and reporting are all automated. AI will be a major driver to help customers attain insight from the massive amounts of data drones will be collecting.

### **What area of the world that people wouldn't expect do you think holds promise for commercial drones?**

We've all heard the 'it's not the drones, it's the data.' True, but we think a bit more broadly at DroneDeploy: Drones are enabling the oldest industries to capture real-time business intelligence for the first time. Construction companies can understand their exact progress, and this morning's crop health can be discovered immediately, allowing for action to be taken. Tools like DroneDeploy are helping to meet the challenges businesses face on a daily basis. Drones make measurement, and therefore management, easier than ever before. Business leaders have long dreamed of getting the bird's eye view of their business, and now that solution is available to everyone.

### **What company that isn't in your category most excited you in the commercial drone space?**

The drone delivery companies - Wing, Zipline, Matternet, and Flirtey. Beyond my excitement about cheaper, faster, lower-emissions burrito delivery, these companies are doing something critical for our customers: driving Beyond Visual Line of Sight operation forward. This is critical for our future as a drone-data company, as we work to simplify drone workflows to zero human steps where a drone in a box can take off daily at all of our customer's job sites creating real-time business intelligence for the real world.

### **What challenges do you face in the adoption of your technology by more customers?**

We'd like to help the industries we serve think bigger. We know what drones and drone platforms are capable of, and how quickly they can scale to solve problems, but the broader business world does not. This a major cultural shift for business leaders and decision makers, and we need to properly market our products and show users what is possible when they begin to think about business intelligence and enterprise solutions in a way that embraces the new technology that is available to them.





**PRECISION***HAWK*

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## DRONE-BASED SOLUTIONS FOR ENTERPRISE

An interview with Heather Barefoot





## How does your company provide value to customer today? How has that changed over the last few years? What industries does your solution concentrate on?

PrecisionHawk is dedicated to changing the way businesses view their assets and manage resources, using drone-based data collection. Clients typically choose us for:

1. **Scale.** PrecisionHawk is the largest source of drone operators in world. With more than 150 full-time pilots and 15,000 licensed operators available to fly any site in the United States within 24 to 72 hours, we deliver unrivaled scale to data collection.
2. **Precision.** PrecisionAnalytics, PrecisionHawk's proprietary analytics system, was built to meet the needs of the world's leading entities. Its machine vision was trained using data and imagery from tens-of-thousands of wind turbine blades, transmission towers, distribution poles, and many other real-world assets. The system's precision is trusted by top 10 oil and gas supermajors, top 50 U.S. utilities, among other notable enterprises.
3. **Advanced operations.** PrecisionHawk is the only commercial drone servicer to hold a blanket waiver to fly beyond visual line of site in Class G airspace in the United States. Our clients benefit from unrivaled efficiencies in data collection per deployment. Also, our accredited remote-sensing team regularly assists our clients in defining cutting-edge applications of drone-based thermal, hyperspectral, and LiDAR sensing.

**We service organizations in:** [Click to View](#)

**AGRICULTURE**

**SOLAR**

**WIND**

**ELECTRIC  
UTILITIES**

**OIL & GAS**

**ARCHITECTURE,  
ENGINEERING, &  
CONSTRUCTION**

## MORE ABOUT OUR SOLUTION

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### DISCOVER

PrecisionHawk's consultants help clients determine measurement objectives, flight plan, and build a technology portfolio.

### COLLECT

Credentialed drone operators—PrecisionHawk's, the client's, or a third party's—use PrecisionFlight to execute flights tailored to a given inspection's specifications. They're assisted by project managers who guide planning and regulatory compliance.

### PROCESS

Drone operators upload data into PrecisionAnalytics to apply machine vision to generate statistics and machine learning to surface trends. Our data analysts validate the findings.

### ANALYZE

Stakeholders, such as Operations Directors, Maintainers, or Asset Managers, use a browser-based interface to view statistics and high-resolution imagery annotated by issue type, severity, and other key parameters.

### REPORT & INTEGRATE

Field Operators reference analysis outcomes in reports or other software, such as asset management or enterprise resource planning systems, as they take action. (Our developers can assist your IT team in accessing a set of standard APIs.)

### ACTION

After maintenance action is taken, drone operators re-deploy drones to validate work performed and record data for historical reference.



## Where do customers find ROI in your solution? Do you have any concrete examples of ROI you can share with our readers?

### SAFE & COMPLIANT DATA COLLECTION

Improved safety is inherent in drone-based data collection. Operators control drones from the ground - away from hazardous areas and assets - using advanced flight automation tools that enable operations precise safety parameters. These parameters are developed by former Navy TOP GUN pilots and industry-leading policy analysts, as part of our enterprise-class safety management systems and standard operating. Though the chance of failure is rare, flight crews are trained to minimize risk of injury and damage to assets.

- Reduce hazardous manhours for field staff.
- Significantly de-risk the deployment of aerial robotics.
- Eliminate the risk of damage, injury, and death associated with manned aircraft or manned asset climbs.
- Ensure field operations are compliant with complex and fluid regulations around airspace and unmanned commercial aircraft operations.

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### **PROOF OF ROI**

- In the renewable wind energy industry, drone-based technology has led to a reduction in climbs of 50%.



## SCALABLE AND SECURE DATA COLLECTION

PrecisionHawk is the largest supplier of flight operators in the world, with more than 150 full-time operators and 15,000 drone service providers in-network. Pilots receive rigorous training prior to and during each client project, including on data quality assurance, security, and chain of custody protocols (NIST SP800-171). Protocols can be customized to meet the rigors of any given security program. PrecisionHawk's in-house team of data scientists work closely with flight operators to ensure data quality meets the requirements of processing and analysis goals. And our flight leaders design standardized flight plans that be deployed across a large fleet in minutes.

- Quickly deploy large-scale data collection initiatives, without the time, costs, and resources associated with insourcing.
- Ensure the accuracy of analytical outcomes by verifying upstream data collection meets the requirements of downstream data processing and analysis.
- Protect the security of data as it's moved from the field to analysts (and later stored). Get the peace of mind that sensitive data is handled with the utmost security.

## EFFICIENT DATA COLLECTION AND ANALYSIS

Our goal is to accelerate and streamline the work of data collection, analysis, and reporting. In PrecisionFlight Pro, operators can develop and deploy sophisticated, repeatable, and automated flight plans. PrecisionAnalytics automatically processes, organizes, and annotates geospatial data. It also applies machine intelligence/vision to automatically produce rich data visualizations, as well as machine learning to surface trends and patterns.

*Continued on next page....*



In terms of cost, drones are more affordable than manned aircraft. Also, in many cases, field staff can collect more data in less time at less cost than manned aircraft or ground-based inspections.

- BVLOS: In the United States, we use our blanket waiver from the FAA to fly beyond visual line of sight without the aid of a visual observer in Class G airspace, thereby expanding the flight distance in a radius of three nautical miles surrounding the deployment area.
- Reduce the time, cost, and resources required to collect and analyze geospatial data.
- Automate routine and mundane processes for analysts and field staff, enabling them to focus on higher-value-add activities.
- BVLOS: Further improve the economics of drone operations by deploying beyond visual line of sight missions.

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## **PROOF OF ROI**

- PrecisionHawk resells fixed-wing drones that can collect aerial imagery over 200 acres in 20 minutes.
- PrecisionHawk's drone-based data collection generally costs significantly less than helicopters and fixed-wing aircraft, which can run up to \$1,200 per rotor hour.
- In transmission line inspections, one major American utility experienced a 28 percent decrease in inspection costs.
- A major wind turbine services reduced their inspection costs by 80 percent.
- Traditionally oil and gas well pad inspections cost \$80-\$90 per well pad, with 5-10 inspected per day. Flown VLOS, \$45-\$60 per well pad, with about 8-16 inspected per day. Flown BVLOS, companies can achieve \$30-\$50 per well pad, with 100-125 well pads inspected per day. By removing the necessity of manual inspections, oil and gas companies can use well technicians to focus on either higher value-added inspections or maintenance alone. The real economic benefit, then, isn't just in the 66% cost reduction or the resulting increase in the number of well pads you can inspect in a day—it's in having those technicians available to focus on uptime and drive or maintain overall revenue.



## ACCURATE, PRECISE, AND RICH, DATA AND ANALYTICS

We fly drones, outfitted with a diverse range of ultra-high-resolution sensors, along a precise and repeatable flight path that's at a close standoff distance to assets and areas of interest. As a result, we capture accurate, precise, and rich geospatial data. Real-time kinematic tools can be deployed to capture data, geolocated within a centimeter of accuracy.

PrecisionHawk's data and flight leaders routinely update our portfolio of drone and sensor hardware to deliver the highest-fidelity data capture possible. Flight operators deploy advanced sensors—such as LiDAR, thermal, and hyperspectral.

PrecisionAnalytics offers a range of machine algorithms to automatically process and annotate aerial data. Apply a variety of visualizations to a single source of data. Produce 2D maps and 3D models. Take basic measures, such as coordinates, distance, area, volume. View a collection of high-resolution photos in an intuitive collection, mapped against the asset of interest. In agriculture, apply a range of vegetative health indices, flood mapping, disease mapping, and other visualizations. Annotate, in-situ.

- The resulting data is processed by machine intelligence in PrecisionAnalytics, to produce high-fidelity maps, models, and analytics.
- Improve the accuracy and fidelity your data analysis and reporting.
- Surface imperceptible issues that are impossible, or at least very difficult, to identify using alternative methods.
- Tap previously untapped sources of data.
- Leverage data for a variety of measurements and applications.
- Unlock previously unattainable applications in geospatial mapping and modeling.
- Produce precisely correlated sets of data, over time.

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## PROOF OF ROI

- In PrecisionAnalytics, view imagery within minutes of upload—produce rich ortho-mosaics in under an hour.
- In transmission line inspections, field tests showed PrecisionAnalytics increased the areas of concern identified by 42 percent.

## ORGANIZE, DISSEMINATE, AND INTEGRATE DATA AND ANALYTICS

PrecisionAnalytics features a concise and intuitive interface, designed for efficiently navigating petabytes of data and analytics. For example, energy companies can view all of their assets, electric, gas, and renewable, on a single map overlay. Farmers can organize their farms and fields into a simple folder structure. Access can be partitioned for a variety of stakeholders with varying levels of clearance.

PrecisionAnalytics offers a range of exporting and reporting features. Produce easy-to-read PDFs and Word documents or export data in a variety of formats given the application, such as shapefiles, prescription maps, and XML.

Also, PrecisionAnalytics features a simple set of APIs that enable integration with downstream systems, such as asset management and enterprise resource planning systems.

- Alternatively, raw data can be delivered from the field directly to other systems using PrecisionTransfer.
- Accelerate the time-to-value, and overall value, of your geospatial data and analytics.
- Prevent data overload.
- Improve data accessibility across your organization.
- Enable the portability of data and analytics from PrecisionAnalytics into any system in your IT stack.
- Produce focused and concise reports for a range of stakeholders, limited to the area of interest.



## What do you think will be most different in the commercial drone space in 24 months?

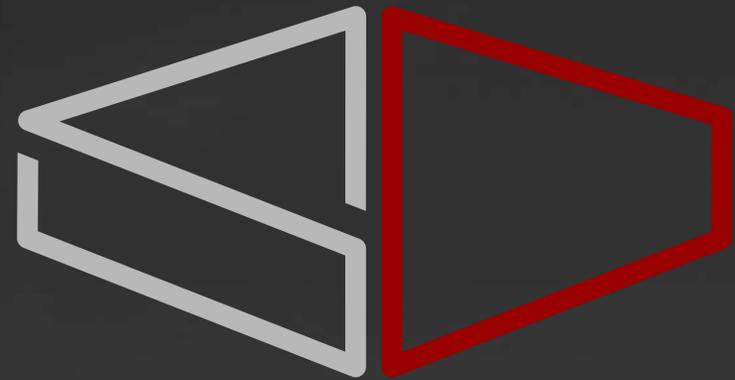
Little more than 24 months ago, the Federal Aviation Administration published Part 107 in the Federal Register. Since then, the industry has expanded rapidly. Where before, the drones were used mainly by individual farmers and hobbyists, the aircraft are now deployed by the world's largest enterprises, at scale.

But, even greater potential remains. Like Part 107, recent regulatory advancements put forth in the U.S. Department of Transportation UAS Integration Pilot Program and the Federal Aviation Administration Reauthorization Act of 2018 have enabled public and private industry to partner in forging the future of commercial drone operations. Through these efforts, beyond visual line of sight operations will be a practice available to a wide range of operators that can prove an effective safety case; drone deliveries will augment last mile logistics; and night flight will make drone operations a 24-hour business. In two years, we expect the drone industry will to have more deeply integrated into the safest airspace system in the world.

## What area of the world that people wouldn't expect do you think holds promise for commercial drones?

While drone-based services are becoming more well-known in industries such as Utilities, Renewable Energy, and Agriculture, a more uncommon use case for drone technology centers around impactful deliveries. PrecisionHawk's work with the [\*UAS Integration Pilot Program \(UAS IPP\)\*](#) in both Virginia and North Carolina has brought to light the concept of deploying drones for time-sensitive medical deliveries in rural and hard-to-access areas.





SeekOps®

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ANDREW AUBREY, CEO

## How does your company provide value to customers today? How has that changed over the last few years?

SeekOps Inc. was formed in 2017 as a spinoff company from the NASA Jet Propulsion Laboratory. Our company brings value to energy sector operators with miniature gas sensor technology, manufactured by SeekOps, flown on Unmanned Aerial Systems (UAS). SeekOps works with major oil and gas companies to offer industry-leading UAS leak inspection surveys, from data collection through delivery, to the upstream and downstream sectors. SeekOps UAS leak detection services provide five times greater efficiency than traditional leak detection methods while reducing data requirements by two orders of magnitude. The company is expanding its offerings with handheld and vehicle-mounted sensor products leading into 2020.

## What industries does your solution concentrate on?

SeekOps solutions are delivered solely to the energy sector.

Our application areas span oil and gas production, transmission, and distribution sectors as well as gas and power utilities. While our services focus is on unique capabilities for efficient UAS leak detection, we also support our existing customers with traditional inspection services including high-resolution visible and thermal imaging and LiDAR mapping.



## Where do customers find ROI in your solution?

Emissions inspection in the oil and gas industry is an ongoing regulatory requirement to maintain safety standards and operational excellence. Enhanced efficiency realized through SeekOps UAS inspections results in reduced inspection times and reduced labor costs. Additionally, our capabilities to find and quantify leaks ultimately lead to increases in safety of operations, environmental sustainability, and conservation of product that can be sold to end users.

## Do you have any concrete examples of ROI you can share?

Our company has demonstrated that the total value of lost product exceeds SeekOps annual survey costs by at least a factor of two. Furthermore, implementation of robust leak detection and repair programs reduce the risk of regulatory agency fines. Coupling direct fiscal benefit with the increases in safety and asset integrity, SeekOps surveys for emissions inspection are compelling for broad industry deployment.

## What do you think will be most different in the commercial drone space in 24 months?

Over this timeframe, regulations will begin to allow remote operations more broadly. This will allow new use cases where drone inspection operations are conducted from central operation centers instead of requiring a pilot in command on-site. For high-frequency inspection operations, this will revolutionize the ROI of autonomous drones in the oil and gas production sector.



## **What area of the world that people wouldn't expect do you think holds promise for commercial drones?**

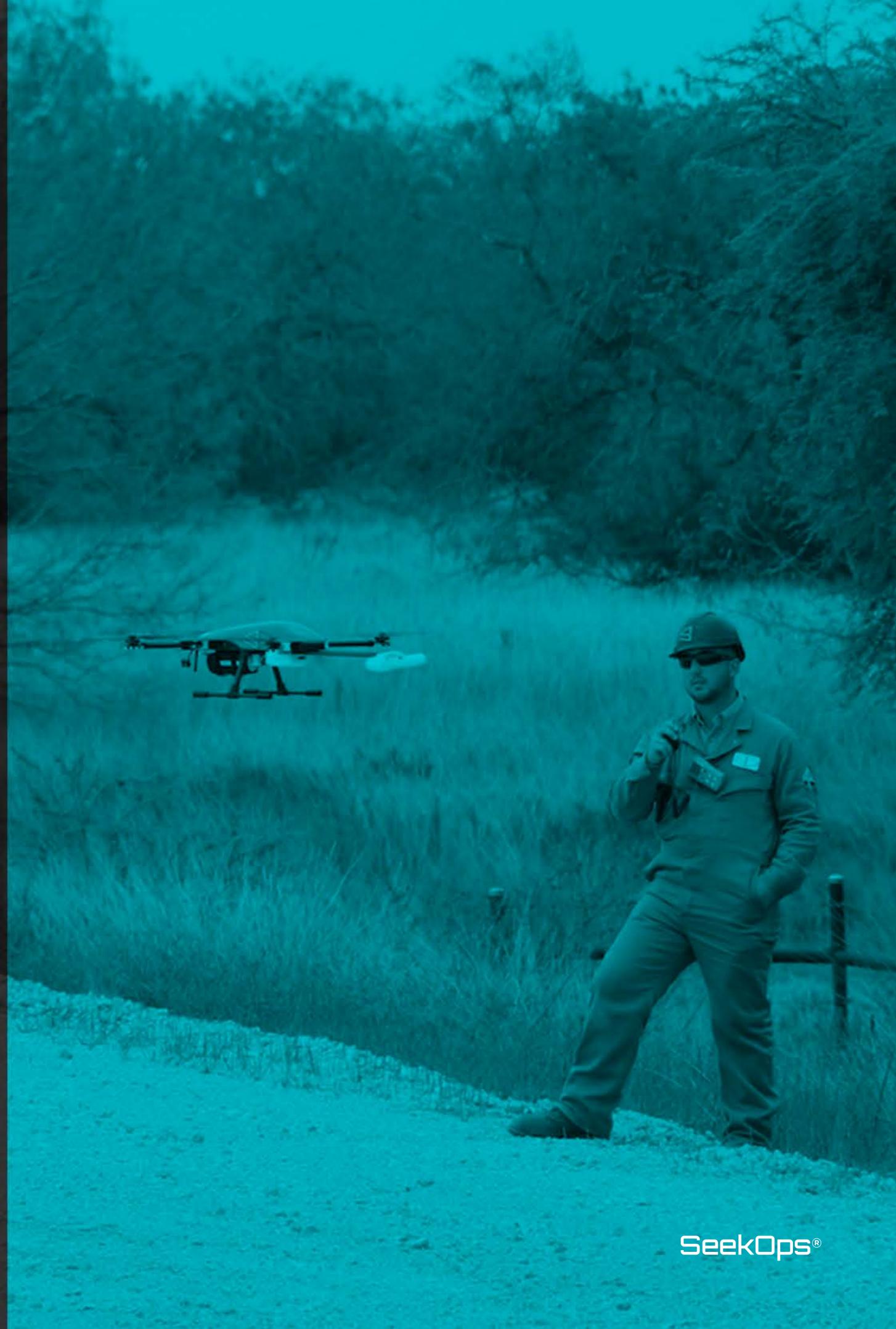
SeekOps is primarily focused on applications of our sensing solutions to the US domestic energy sector. However, we operate internationally when new opportunities exist with our customers. Both Canada and Oman are regions where production is increasing while prioritizing new technology adoption and high standards for sustainability. We anticipate regular work in these production regions to help maximize the efficiency of these oil and gas production assets.

## **What company that isn't in your category most excited you in the commercial drone space?**

I get most excited about developments in the United States drone design and manufacturing space. One revolutionary company is Impossible Aerospace who manufacture the US-1. The revolutionary power system of the US-1 dramatically increases the endurance for small multirotor systems and will enable value for commercial rotary-wing BVLOS.

## **What challenges do you face in the adoption of your technology by more customers?**

SeekOps uniqueness lies in its sensor technology. UAS deployment of our SeekIR sensors provides efficient facility surveys and delivery of high-value quantitative emissions data. One aspect slowing our adoption rate is the industry's reliance on imaging technologies. The Seekops solution provides comprehensive inspection at lower operational cost while delivering actionable data to operators. It doesn't take long to convince customers as to the value of quantitative data – industry exposure to operators and regulators is what is needed for broad adoption.





**Kevin Schrage**

Intelligent sensing and analytics digitize crops today for more efficient and predictable food supplies tomorrow.

## How does your company provide value to the customer today? How has that changed over the last few years?

We provide value in two different ways. First, with the use of our sensors and SlantView™ software, our products deliver a suite of crop measurements to growers, agronomists, drone service providers, and drone system integrators. This crop information allows them to make better decisions throughout the growing season to produce better crops. Second, we provide data analytics services, which includes our Aerial Phenotyping service for test plot research.

Our company was originally focused on selling our sensors and SlantView software to the first group of users. We then saw an increasing interest in using our technology for very specific applications within the agriculture research community. Much of the in-field research is conducted using test plots, which are arrays of small plots, typically a few rows of plants wide and only several meters long, that are laid out in a grid pattern across a test site. Each of the plots may contain a different seed hybrid, treatment program, or both, with the intent to evaluate the performance of the crop across a season.

Phenotyping involves the measurement of the various metrics about the crop to support the goals of the trial. This has traditionally been a manual process and can be very time-consuming, expensive, and prone to error. We saw an opportunity to customize our data collection and processing workflows to provide this data from an aerial platform in an automated and repeatable way. This included some enhancements to our navigation system, including the integration of RTK GPS, as well as some customization of our analytics to accurately assign the contributions of each image to the appropriate plots within the trial.

This led to the launch of our turnkey Aerial Phenotyping services. The service includes the collection of multispectral imagery over the trial, typically multiple times over the course of a season, and the delivery of tabulated results to the customer for each and every plot within the trial, including metrics such as plant counts, plant size distributions, chlorophyll index, vegetation fraction, NDVI, stress values, yield potential, and other custom analytics based on the needs of the customer. This provides a solution for our customers that allows them to focus on the results and their research rather than the process of collecting and processing the data itself. We are now going into our 3rd season of the service and are proud to support the research of companies such as Bayer, BASF, Land O'Lakes, AgReliant, and many others.

## Where do customers find ROI in your solution?

Our aerial phenotyping customers find ROI in our solution in a couple of different ways. These customers are typically doing test plot research or breeding. Traditionally they would collect data on their test trials by hand which is time-consuming, expensive, and often doesn't provide complete and comprehensive data on their trials. Collecting aerial data is typically cheaper than human scouts, more accurate, and can provide data that isn't feasible by humans, such as plant size measurement for each of the 1000's of plants in a typical trial. The efficiency and accuracy of the data helps them accelerate their research and ideally, reduce the time-to-market for new seed products.

One way our sensor and analytics customers find ROI in our solution is by saving on crop inputs. When growers measure their crops, they can locate nutrient deficiencies, pests, weeds, irrigation issues, and can even count and size plants for early season yield predictions. This allows them to make smarter decisions on what crop inputs to apply, where to apply them, and at what rate. They can greatly reduce the number of inputs by creating variable rate prescriptions and address the problem areas instead of the entire field. Growers can also find ROI with crop insurance claims, pre-harvest yield predictions, and identifying issues to improve their crops during the growing season.

## Do you have any concrete examples of ROI you can share?

"SlantRange's industry-leading sensor and analytics technology adds valuable and unique new metrics to our research and breeding programs that will improve our ability to characterize plant development." G. De Both - Bayer Crop Science (Now BASF)

We're proud to be partnering with SlantRange on the integration of our Azure IoT suite with their leading sensor and analytics solution, allowing them to provide valuable data and insights at the scale required by the biggest agri-businesses in the world." Dinesh Narayanan - Microsoft

Nutrien, the world's largest provider of crop inputs, is using our technology to add another level of exceptional service for their growers.

This Minnesota corn grower saved \$35 per acre by implementing a variable rate fertilizer program based on data from our analytics platform.

## What do you think will be most different in the commercial drone space in 24 months?

A change in regulations has the potential to make a huge impact. In an industry like agriculture, the current Line-of-Sight requirements can make it difficult to cover the large number of acres needed to survey crops. BVLOS and automation would change things drastically. We believe there will be changes made within the next 24 months that will allow for more BVLOS operations and possibly fully autonomous data collection, analysis, and action workflows in agriculture.



## What challenges do you face in the adoption of your technology by more customers?

Our biggest challenge is changing conventional farming methods. The agriculture industry faces a number of different challenges throughout the growing season. They only get one shot to produce a good crop each year and they are wary of adding another element to their process without knowing if it will provide value. Once they realize the potential cost savings and that it's proven to be a more efficient and accurate way to monitor their fields, they are willing to add it to their workflow to improve yields.

## What area of the world that people wouldn't expect do you think holds promise for commercial drones?

For agriculture, the developing world holds promise. As the cost of aerial measurement and input application comes down, and as the utility of these systems improves, the capabilities of 21st-century farming techniques become more accessible.



# SEC. 3

THE WILDCARD



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## AUTONOMOUS DRONE SYSTEMS

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# THE IMPACT OF AUTONOMY

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Guinn Partners believes that autonomous drone stations (ADS) will gain significant market share in the BVLOS future and adversely affect the growth prospects of drone service providers over time because they offer giant value.

Full autonomy is the next wave of innovation in the drone market for commercial purposes because it offers significant benefits in capability, consistency, and cost in collecting vital data versus human collection or manually controlled drone use.

With an exponential increase in autonomously collected data, the importance of software to enable visualization of that data, provide context, and enable searching will also increase for these same commercial entities.

Mature ADS are already in the marketplace and in the next 24-48 months existing and new ADS platforms will be a compelling alternative to drone services.



# FEATURED PLATFORMS

## MAINSTREAM DRONE IN A BOX



Industry intel places boxes already in the field in testing



sunflower labs

Most complete current affordable mainstream solution

## INDUSTRIAL/NICHE



PERCEPTO

SECURITY & INSPECTION

AIROBOTICS

MINING & SECURITY



NIGHTINGALE SECURITY

SECURITY

AZUR DRONES

SECURITY



EASY AERIAL  
SMART SECURITY

DEFENSE

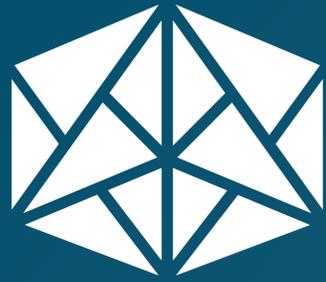


AMERICAN ROBOTICS

AGRICULTURE



*The Guinn Partners team believes strongly that these systems are the future of the drone industry, and that that future is coming faster than anticipated. We interview several of our favorite companies in the space that we view as having a very promising opportunity in two of the leading industries to be impacted by ADS first - agriculture and inspection.*



**PERCEPTO**

DOR ABUHASIRA, CEO

## How does your company provide value to the customer today? How has that changed over the last few years?

Percepto's autonomous drone-in-a-box solution provides value to customers in the following 4 domains:

1. Security
2. Safety
3. Operations and maintenance optimization
4. Compliance

Over the past year, we have enhanced our computer vision and AI capabilities such that we can provide a greater value in all of these domains. For example: in the security domain we have significantly improved our detection and tracking capabilities and in the operations domain we now offer anomaly detection in the form of gas leak detection, oil spill detection, solar panel change, etc.

## What industries does your solution concentrate on?

Energy, oil and gas, large industrial sites and mining.



## How does your company provide value to the customer today? How has that changed over the last few years?

ROI examples include:

1. Increased uptime and productivity - Our solution enables early detection of possible faults by running routine, frequent inspections and applying deep learning technology to the data captured over time. This early detection not only helps improve maintenance cycles, but also helps prevent catastrophes since problems are detected early before developing into greater safety risks and/or resulting in an operational shutdown.
2. Increased safety - By using autonomous drones, organizations can reduce potential hazardous scenarios involving personnel by conducting risky missions such as inspection of hard to reach places, and responding to safety events (such as fire) using autonomous drones.
3. Savings in auditing and insurance - By using the Percepto solution, organizations can be better prepared for auditing and compliance. Sites that employ Percepto systems have an archive of the data the drone has gathered from all previous missions to form a comprehensive history of site conditions. They can also reduce insurance costs as inspections are done more frequently and risky missions no longer have to be conducted physically conducted by employees.
4. Reduced infrastructure costs - In cases of greenfields where the drone runs patrol and replaces the need for a full fledged video surveillance solution across the entire perimeter (sometimes, in cases like mining and oil & gas rigs, this infrastructure is not even possible).
5. Reduced headcount costs - the drone system augments team capabilities for security and inspection tasks without a need to increase headcount.



### **What ROI have your users seen in the field?**

While we envision the value of our system being in increased efficiency and safety we can provide with the insights and analysis of the aerial data, we have been really surprised by the immense value clients found in just having a drone they can operate on demand and autonomously in remote locations. Before the Percepto system, some of our clients spent a few million dollars a year just having people repeatedly getting to places that are far and hard to reach due to terrain and weather issues. When it comes to monitoring gas pipeline integrity or mine safety there are costly routine inspections that our drone can do much more frequently at a fraction of the cost.

### **What do you think will be most different in the commercial drone space in 24 months?**

We expect to see a higher adoption rates of autonomous drones by the industrial market. Today this is still an early-adopters market, but we have no doubt that this will change within the next 24 months. By then, organizations not using such a solution will be at a disadvantage to those that do. We also believe that we will see many more BVLOS waivers and the turnaround for a BVLOS waiver request will be much faster.

### **What company that isn't in your category most excites you in the commercial drone space?**

Flytrex are doing an amazing job in drone delivery, both on the operational side as well as working through regulation.

### **What challenges do you face in the adoption of your technology by more customers?**

Regulation is the biggest hurdle. When there are established regulations, the speed of market growth for autonomous drones will be swift.





# *NEXT GENERATION OF DRONE TECHNOLOGY*

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REESE MOZER, CEO

American Robotics is an industrial drone developer for agriculture specializing in rugged, real-world environments. The company was founded by Carnegie Mellon and Stanford roboticists with a shared vision for bringing robotic technology out of the lab and into the real-world to solve global challenges. Through innovations in robot autonomy, machine vision, edge computing, and AI, American Robotics has created the next generation of drone technology.

*BUILT FOR THE FIELD*



## **How does your company provide value to customer today?**

American Robotics has created the Scout™ - a fully-automated drone capable of continuous, unattended operation. Unlike traditional drone products, Scout systems live in the field for multiple years, performing multiple missions per day without physical human interaction. The result of this automation, as well as the critical edge computing power that lives within each base station, is the ability to capture data at resolutions, frequencies, speeds, and prices never before feasible. This unique and proprietary fully-automated “drone-in-a-box” currently stands alone as the sole practical drone system for our beachhead market: agriculture.

The Scout™ platform consists of (1) a fully-autonomous drone with modular camera and sensor payload, (2) a ruggedized base station for housing, charging, data processing, and cloud transfer, and (3) our analytics and front-end software package, ScoutView™. Once installed, a fleet of connected, weatherproof Scouts™ remain indefinitely in a customer’s fields, autonomously surveying each day, self-charging, and seamlessly delivering reports and analysis regularly and reliably.

## **What industries does your solution concentrate on?**

Each industry has unique requirements and use cases for autonomously collected aerial imagery, and so some specialization is required for each. American Robotics’ initial focus has been in commercial agriculture, serving both the grower and small-plot research communities. As we have continued to mature this solution, we’ve begun expanding and customizing our solutions for other industries including energy and security.

### **Where do customers find ROI in your solution?**

Until the development of our fully-automated solution, commercial growers and agricultural corporations experimenting with drones have discovered them to be prohibitively expensive, complex, and time consuming. Most quickly realize that implementing drone operations into their business requires investing in a drone fleet and hiring a full-time piloting staff. With the true automation achieved in Scout, addressing all aspects from imagery collection to edge processing to analysis and reporting, we give growers the earliest possible visibility to issues in the field, and enable them to optimize inputs, reduce labor costs, and improve yields.

### **Do you have any concrete examples of ROI you can share?**

"In order for drones to really find their place in ag, this is the step that has to happen. They need to be autonomous. It takes way too much time and work for most farmers to be able to get the value of the data that drones can collect."

*- Mid-Kansas Cooperative, about Scout*





### **What do you think will be most different in the commercial drone space in 24 months?**

The driving force of change in the commercial drone space will be FAA authorizations for Beyond-Visual-Line-of-Sight (BVLOS) operations. The dam is starting to break, and several important precedents have been set regarding BVLOS-related technology and waivers in the past 12 months. As waiver approvals accelerate in 2019 and 2020 facilitated by the integration of cost-effective aircraft avoidance sensors, commercial operations so many have theorized about will finally be possible.

Quickly following this breakthrough will be true autonomy. For any operating scenario that calls for repetitive surveillance over a fixed area, removing the human pilot from the loop is the only way drones can make economic and logistical sense. By our estimation, these types of operating scenarios represent 80%-90% of the proposed commercial drone market, and include agriculture, oil & gas, utilities, asset security, mining, landfills, and more. Automated remote operations enabled by pilotless drone-in-a-box solutions will begin servicing these industries on a grand scale, and this new phase will uncover a sales trajectory that eventually outpaces that of consumer drones.

### **What area of the world that people wouldn't expect do you think holds promise for commercial drones?**

I think people don't fully appreciate how many drones will be flying on a near-constant basis throughout the world, autonomously monitoring everything from farms to power plants to pipelines, once BVLOS and automation are enabled. Despite the flow of press for the past 10 years, we haven't even scratched the surface of commercial drone operations. Drones will soon transition from an expensive novelty to industry standard in these verticals, and the flight hours and data collected per day will grow exponentially. This means the whole world becomes the addressable market, not just the countries that can afford new technology.





# sunflower labs™

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**Alex Pachikov, CEO**

Sunflower Labs makes an autonomous outdoor security system that senses and deters unwanted visitors. Our sensors detect motion and vibration, differentiating between people, animals, and cars. When they detect something unusual, they'll notify you and deploy a fully autonomous drone. The drone flies directly to the scene and streams live video of what's happening. Guided by our sensors, it follows the activity, performs a security "sweep," and lands itself safely in its weatherproof docking station.

## How does your company provide value to customer today...or how will it in the near future?

We are building the next-generation security solution. Our belief is that autonomous drones will usher in a revolution in outdoor security by providing a dynamic observation and deterrence system that is easy to install, configure and operate. Our system is fully autonomous. The user does not need to know how to fly the drone. The only input we need is where the operator would like to look, and even that can be determined automatically based on signals from ground sensors.

With a single system we can cover a radius of 150 yards from the location of the base station and we can be at any point in under 30 seconds. What is unique is that our system is capable of tracking moving targets and providing continuous live video footage that is hard to achieve with a network of stationary cameras.

In addition to stand-alone operations, our system can be coverage, and reducing the need for manned patrols or security guards.

## What industries does your solution concentrate on?

We are starting with the high-end residential market. We have a lot of demand coming from there, and we see it as a great beachhead into a broader security market. Ultimately, the technology we are building is widely applicable in all types of commercial, industrial and agricultural settings. Our initial focus on the residential market allows us to focus, refine our technology, and establish a proven track record in a market that is more enthusiastic and accepting — allowing us to later extend into larger and more demanding markets.



## Where do customers find ROI in your solution?

We provide an effective, easy-to-deploy, and flexible solution when compared with installation of a network of stationary security cameras. We expect our solution to be more economic than a deployment of 10+ cameras, and in time we expect to be competitive with any other security solution on the market.

## Do you have any concrete examples of ROI you can share with our readers? This can be facts/stats, case study links, testimonials, etc

A comprehensive security system installation can cost upwards of \$25,000 for a large home or property and still not cover the property completely. While these types of system have their own advantages, our solution can provide much better overall coverage for less than half the cost. Over time, we expect our system to be competitive even at the smaller scale, with our system providing all the capabilities of fixed cameras, but with the addition of all the functionality of our drones.

Most importantly, a security drone provides deterrence that is only be matched by the presence of security guards. Few things are as intimidating as a drone that follows you around the property that you should not be on.



## What do you think will be most different in the commercial drone space in 24 months?

I think the entire commercial drone space was going through what analysts refer to as a “trough of disillusionment”. Much has been promised, but technical and regulatory hurdles held it back. But during this year I have seen a number of breakthroughs where products that were envisioned years ago and finally reaching the market and providing real benefits. I expect this trend will continue over the next couple of years as we see the second coming of drone technologies and products realize their potential in the market.

## What area of the world that people wouldn't expect do you think holds promise for commercial drones?

The problem we are solving is not specific to any geography. I am constantly surprised how overlooked physical security is in terms of technology adoption, specifically with regard to drones. It is such an obvious use case for me - and it applies to every place in the world.

There is a lot of talk about using drones for deliveries, and while it is certainly happening, the more near-term reality is using drones for security. The market is just as broad, the advantages are substantial, the need is universal, but the challenges are a subset of what is required for a long-distance delivery network.

Security drones can be geofenced to a fixed area which is most likely a private property. They fly at a lower altitude — in most cases below 50 feet, and the weigh much less — ours is under 3 pounds. All of this makes it an ideal stepping stone in deployment of autonomous flying vehicles into our lives and societies anywhere in the world.

## What company that isn't in your category most excites you in the commercial drone space...and why?

I am really impressed by a company called Wingra. They built a very elegant solution for a very complex problem of mapping and surveying large plots of land. I have seen the company grow and evolve, and the solution they have on the market right now is orders of magnitude better than the closest competitor, even among bigger players.

I also recently got a tour of Elroy Air. The logistics solution they are building would be extremely impressive for a large company, but the fact that they are doing it as a start-up is truly inspiring.

Full disclosure, the CEOs of both of these companies are my friends.

## What challenges do you face in the adoption of your technology by more customers?

From the start, we always knew that reliable precision landing will be essential for any fully autonomous system. If you can't land — you can't charge, if you can't charge — you can't fly. We started our design process from this principle and it influenced every element in our system. The unique shape of our drone, and the matching counterpart of our landing system, allows us to bring the drone safely into its basestation even in very poor weather conditions. Building this system has been, and will continue to be, our top challenge and accomplishment.

Right now our main goal is bringing our solution to market. There are still challenges ahead of us, but we are happy to see progress on the regulatory front, as well as safety and reliability performance that makes the system a viable solution.

When we started our company in 2016, we figured we were about 3-4 years ahead of the times. I am happy to stay that just a few weeks ago (May 2019) - we had the first public deployment of our system and it performed better than we optimistically hoped. Feels like we are right on track.



# SEC. 4

## LOGISTICS

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Adoption of new technology is a complex process, especially in industries with entrenched methods of doing things, and long-term capital investments for equipment and training programs for skilled labor. As the commercial drone industry seeks to live up to its potential, it takes more than just the drone technology, the sensors, or the software - it takes an emphasis on the less exciting parts of the process - compliance, insurance, and standard operating procedures.

The companies looking into these portions of the industry are doing the hardware and software providers a massive favor and helping accelerate enterprise adoption and provide fewer reasons for organizations to wait to adopt this new technology and realize the value it provides. We spoke directly to some of these logistics companies about their industry position, consumer ROI, and vision for the future.



PRECISION  AUTONOMY



**PRECISION AUTONOMY**

Mark Halverson - CEO





## How does your company provide value to customers today?

Precision Autonomy is accelerating the world's safe adoption of autonomous services. We use software and algorithms to create a dynamic, value-driven insurance experience for an increasingly automated world. Today, we are focused on practical solutions for commercial drones.

Our proprietary risk rating engines provides unique data intelligence via an end-to-end digital platform for insurance brokers and insurance carriers to assess risk, and enable small, mid-market, and global operators to manage profitable, safe operations.

## What industries does your solution concentrate on?

As an InsurTech business, our solution is designed for risk managers in industries and enterprises that have an increased risk of using drones and other autonomous devices.

Precision Autonomy works closely with regulators, legislators, law firms, insurance brokers, and insurance companies to help enterprises integrate drones and other autonomous operations into existing risk management frameworks.





## Where do customers find ROI in your solution?

Precision Autonomy provides flexibility and control of drones and autonomous operations backed by comprehensive enterprise-grade coverage.

With autonomous devices being quite new, we are focused on using data to assess and price actual risk. Today, our insurance partners can profitably provide accurately priced insurance so drone operators can safely increase drone operations.

## Do you have any concrete examples of ROI you can share?

One customer has 30 pilots that are contracting predominantly for roof inspections. Each pilot is flying about 90 minutes per week and the usage-based system is saving an average of 80% on their insurance premiums.

Another large enterprise customer with over 40 drones had a situation where its fleet was grounded for 2 months. Because of the usage-based system, they saved a significant amount of money.

Finally, in drone insurance the average number of days to pay a claim is around 35. One of the initial claims coming through the Precision Autonomy system was paid in 13 hours. Getting back up in the air quickly is a huge value to those operating with Precision Autonomy.



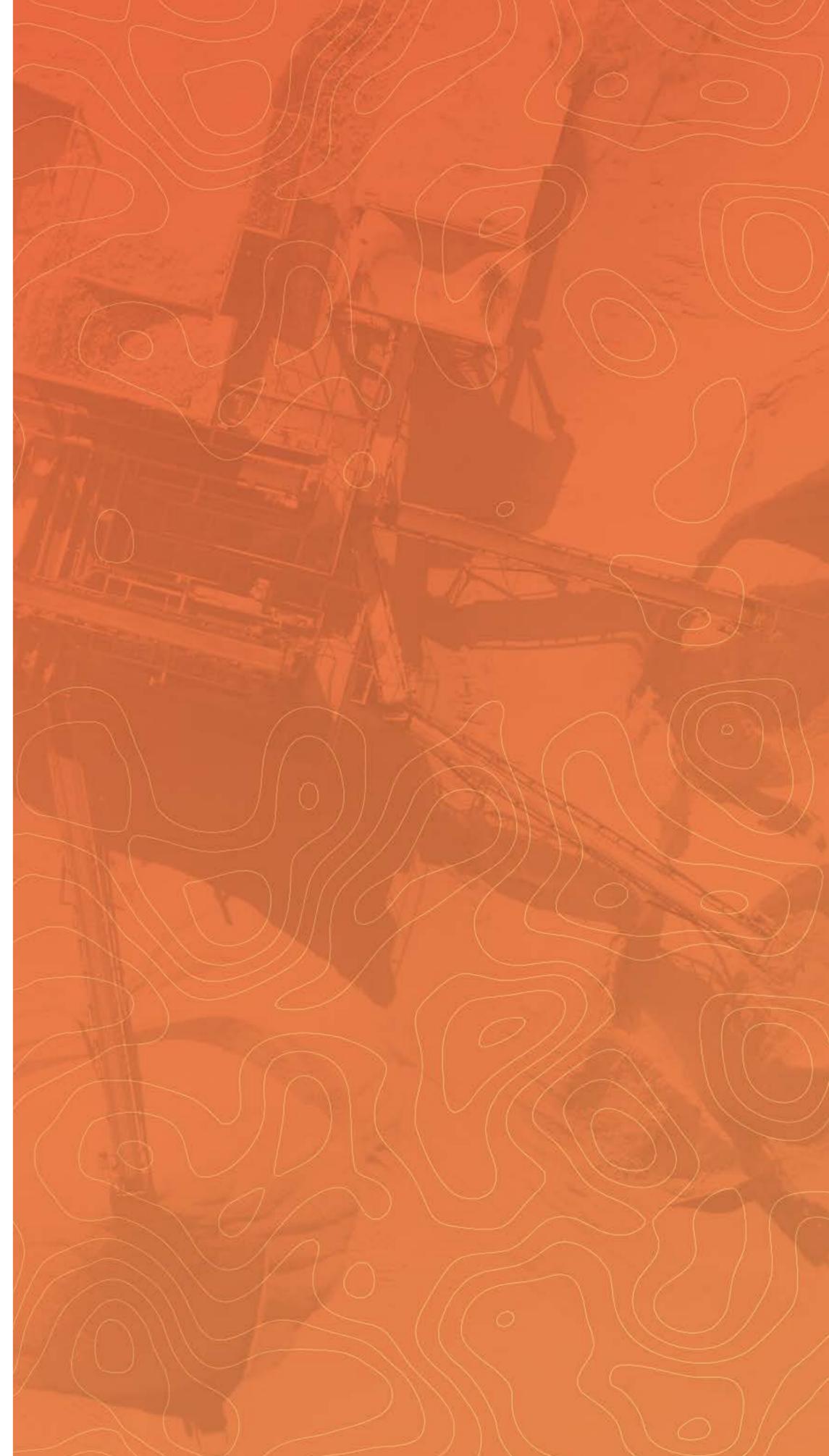
## **What do you think will be most different in the commercial drone space in 24 months?**

The financial impact of drones will become clear to large corporations. Drones and other autonomous devices are increasingly on the C-suite risk management agenda based on the structural cost savings opportunities, as well as the financial, PR, and brand risks.

Also, BVLOS operations will become even more prevalent, opening the door for exponential growth in the number of use cases for drones across all industries.

## **What area of the world that people wouldn't expect do you think holds promise for commercial drones?**

Wherever there is significant infrastructure investment being made (e.g. roads, pipelines, electric delivery systems, etc) there is commercial drone growth. We have started to see inquiries come in for insurance for drone fleets measured in the thousands of devices alongside major infrastructure development projects in developing countries.





## What company that isn't in your category most excited you in the commercial drone space?

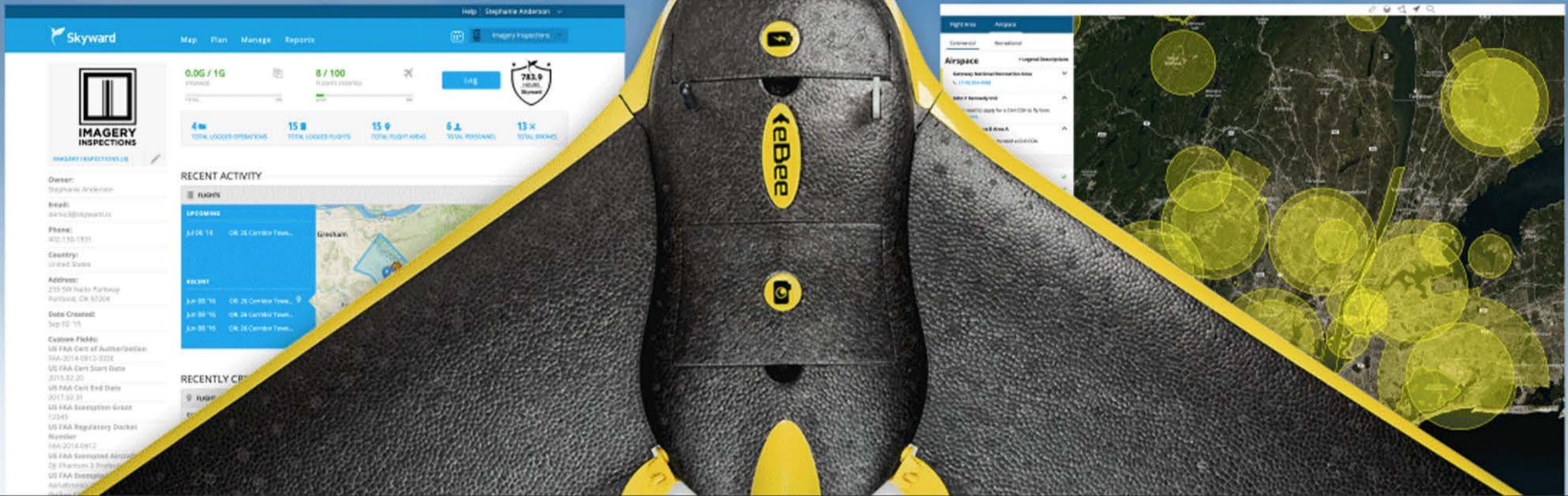
We are excited about advancements with companies using drones to intervene in school shootings and those that support drone delivery and transport services such as medical organ transportation and people transportation (drone taxis) to remove urban congestion.

## What challenges do you face in the adoption of your technology by more customers?

As it relates to insurance, we see an increase in the adoption as insurance is often needed to support the growth of new industries and technology. We are seeing large enterprises demand insurance for the actual risks being taken within drone programs as they reap the cost reduction benefits of using drones.

PRECISION  AUTONOMY





# Skyward

Jessica Moody, Director of Communications



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## How does your company provide value to customer today? How has that changed over the last few years?

Skyward is the leading authority on safe, efficient drone operations. Our software platform gives companies comprehensive oversight of teams, equipment, projects, and flights, as well as automated access to controlled airspace and a digital system of record. Our team of consultants also provides a range of services to help enterprises stand up drone programs including provisioning drones, tablets, and data-processing software, developing proofs of concept, creating efficient workflows, and training teams.

Skyward was founded to help companies maximize the safe and efficient use of drones and to enable drone pilots to safely access and share airspace.



## What industries does your solution concentrate on?

Skyward supports enterprises deploying fleets of drones across distributed teams. Our customers are using drones to add value to their businesses in energy, utilities, oil and gas, mining, commercial construction, media, real-estate, infrastructure inspection, and more.



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## Do you have any concrete examples of ROI you can share?

### **Brasfield & Gorrie**

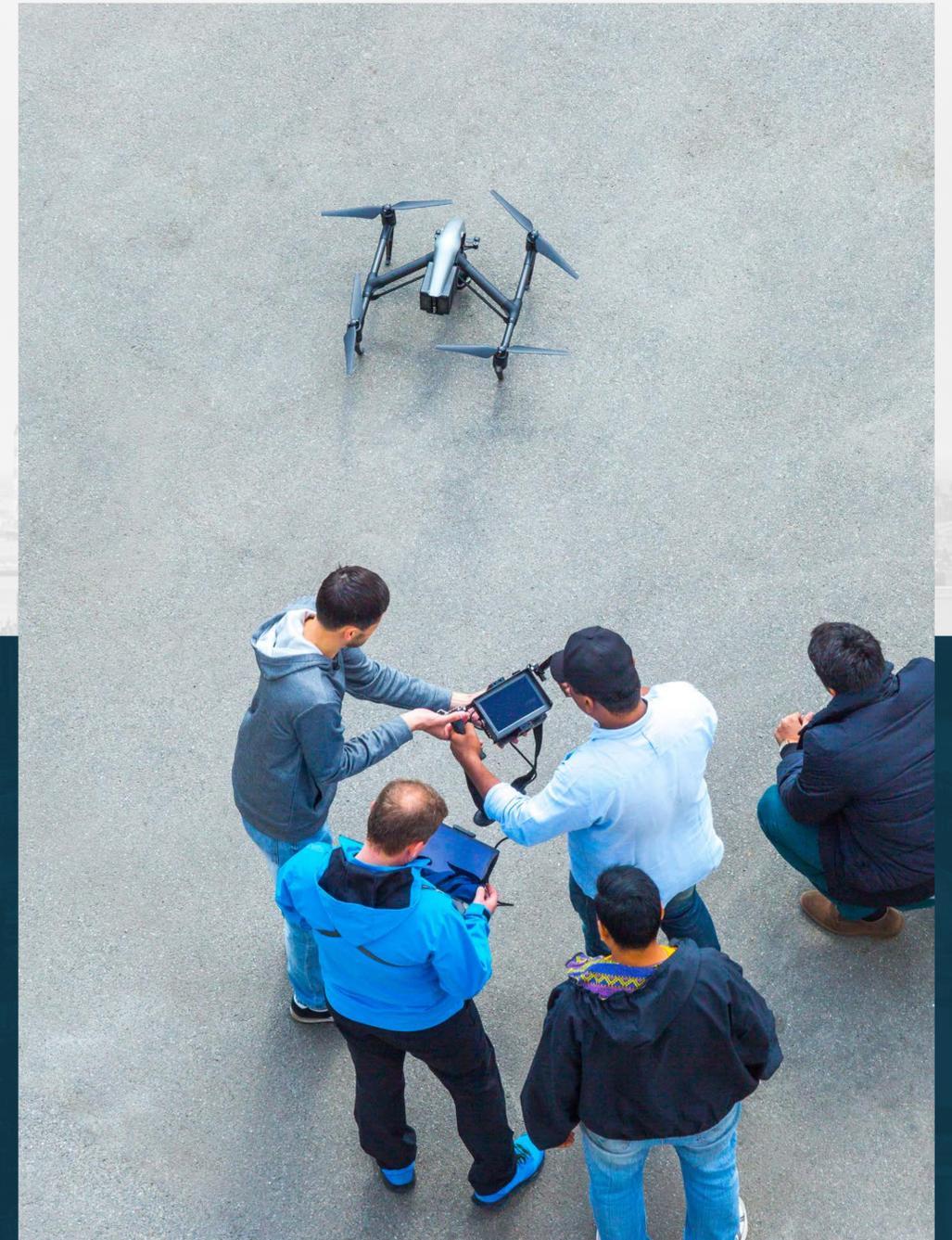
Brasfield & Gorrie needed a solution to manage their data and assets that was more navigable and functional than a shared spreadsheet, while allowing them to oversee widespread and growing drone operations across the country and ensure compliance with regulations. "How are you going to track all this information, and help the guys in Orlando, and Atlanta, and Nashville, and Dallas, to see the same things you're seeing? We had that frustration most of last year, and then onboarded with Skyward and a lot of that started to get ironed out very quickly."

—Hunter Cole, Virtual Design & Construction Coordinator, Brasfield & Gorrie

### **Hensel Phelps**

"Skyward was the biggest factor in getting our drone program approved. What our legal team loved was the thoroughness of the software and the ability to document pilots. All of our information is on the web and contained in one database, so all of our district teams, our legal team, and the safety team can access this information whenever they need to. At Hensel Phelps, we really pride ourselves on safety. Skyward gives Hensel Phelps the ability to keep one central drone flight logbook for their entire organization, allowing them to track pilot hours, flight records, and maintenance in the same place where they maintain regulatory compliance. It works with any drone from any manufacturer, and it's easy to integrate new aircraft."

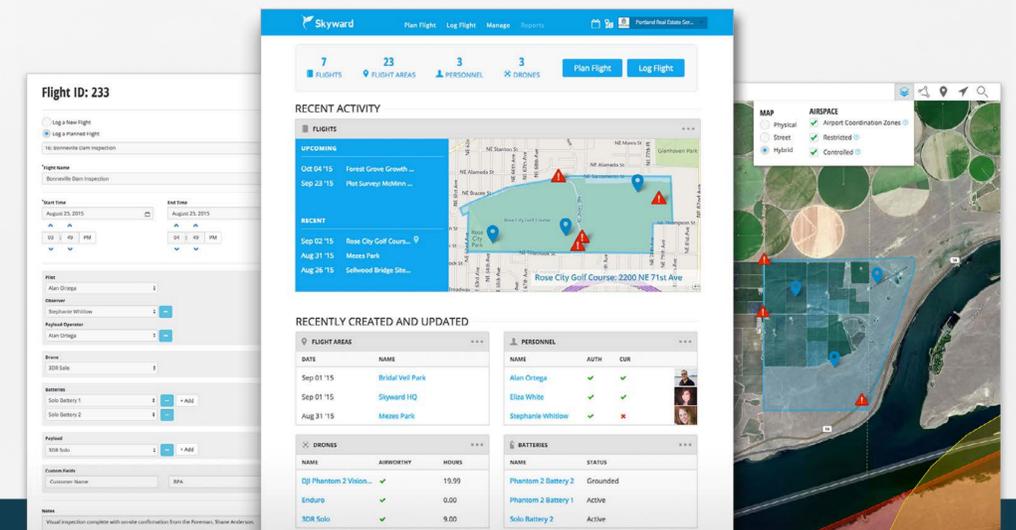
—Richard Lopez, Virtual Design & Construction Manager, Hensel Phelps



## POWER Engineers

“The biggest thing that we use Skyward for is flight planning and to make sure that we weren’t in airspace that required further authorization. We don’t really have time in our schedule to obtain waivers from the FAA or work with the military. So we were able to tailor this flight into a small area. I look to Skyward as a tracking tool that will help us differentiate ourselves and have all that information, especially our safety record, to show clients that we have a robust system that’s tracking everything that we do, from planning to delivery. So if they ask about flight hours and experience, we’ll have that ready, with all our insurance documentation and certifications.”

—Aaron Ames, Manager of Mapping and Analysis, POWER Engineers



## Southern Company

The flight team at Southern Company points to six capabilities the software and company provide that are critical to making their UAS program a success:

1. Instant flight plan authorizations. “In the utility space, we have to be very fluid and dynamic with our operations,” explains Chief UAS Pilot Corey Hitchcock. “Things can take place at a moment’s notice. We have a power outage, and we need to go look at it right then. We use the Skyward app to acquire LAANC authorizations, which allow us to fly in controlled airspace a lot faster than we could in the past.”
2. Data collection and analysis. “One of the biggest problems Southern had was being able to track our UAS operations, gather data from them, and be able to communicate that data across the company,” says Hitchcock. “We decided to partner with Skyward and Verizon due to the quality of their product.” On Skyward’s platform, everything from safety management system data to flight hours per asset can be digitally tracked and reported, information that Southern used to collect on paper. Director of Flight Operations Harry Nuttall adds, “without a system like Skyward’s, all the performance-based data we’re gathering would be lost, and we need to track this so we can build better processes.”
3. Staying ahead of regulations. UAS is a rapidly evolving technology, with federal rules that guide how, where, and when pilots can fly in flux. “Skyward’s regulatory knowledge and relations with the FAA have allowed us to focus on what we do best and that’s keeping the lights on,” says Hitchcock.
4. Real-world training. Hitchcock notes, “Having Skyward’s quick digital access to controlled airspace lets us train new pilots using exactly the same process we use in our day-to-day operations. The ability for us to train in real time really makes operations in the field that much easier.” The company can get a very proficient drone pilot up and running in a matter of weeks.
5. Scaling across the enterprise. Skyward’s consulting team and fleet management software have made it simpler for Southern to begin to scale UAS operations. “We want to make UAS a tool for any employee who wants it, not some specialized thing that only a certain person can do,” explains Hitchcock. “We want an engineer to have it as a tool in their toolkit. We want our linemen to be able to use it to cut down on outage times and find easier access into isolated environments.”
6. Deconfliction during disasters. Hitchcock: “Tracking our data, knowing where our pilots are, and deconflicting our airspace are all really important during disasters, when we have manned helicopters flying our lines and rescue helicopters doing operations. Skyward lets us know where manned aviation is and where our operators are, so we can keep those assets apart and allow safe operations inside the National Airspace System.”



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### **What do you think will be most different in the commercial drone space in 24 months?**

Our customers will develop much more sophisticated drone programs, with expanded use cases and teams. They will be able to fly in more ways and more places, with drones connected to LTE. Connected drones will unlock safe and secure beyond visual line of sight flights, real-time data transfer, and more. More industries will begin using drones for delivery and we'll see rapid advancements in human passenger carrying drones.

### **What company that isn't in your category most excited you in the commercial drone space?**

We're excited to see drones equipped with artificial intelligence technology to provide real-time actionable data and intelligence. Coupled with 5G connectivity, AI-equipped drones will enable our customers to truly revolutionize their businesses in ways we can't yet predict. This year during Verizon's keynote at CES, Skyward president Mariah Scott featured the capabilities of UnleashLive to do real-time damage assessments, traffic pattern analysis, and data trend visualization.

### **What challenges do you face in the adoption of your technology by more customers?**

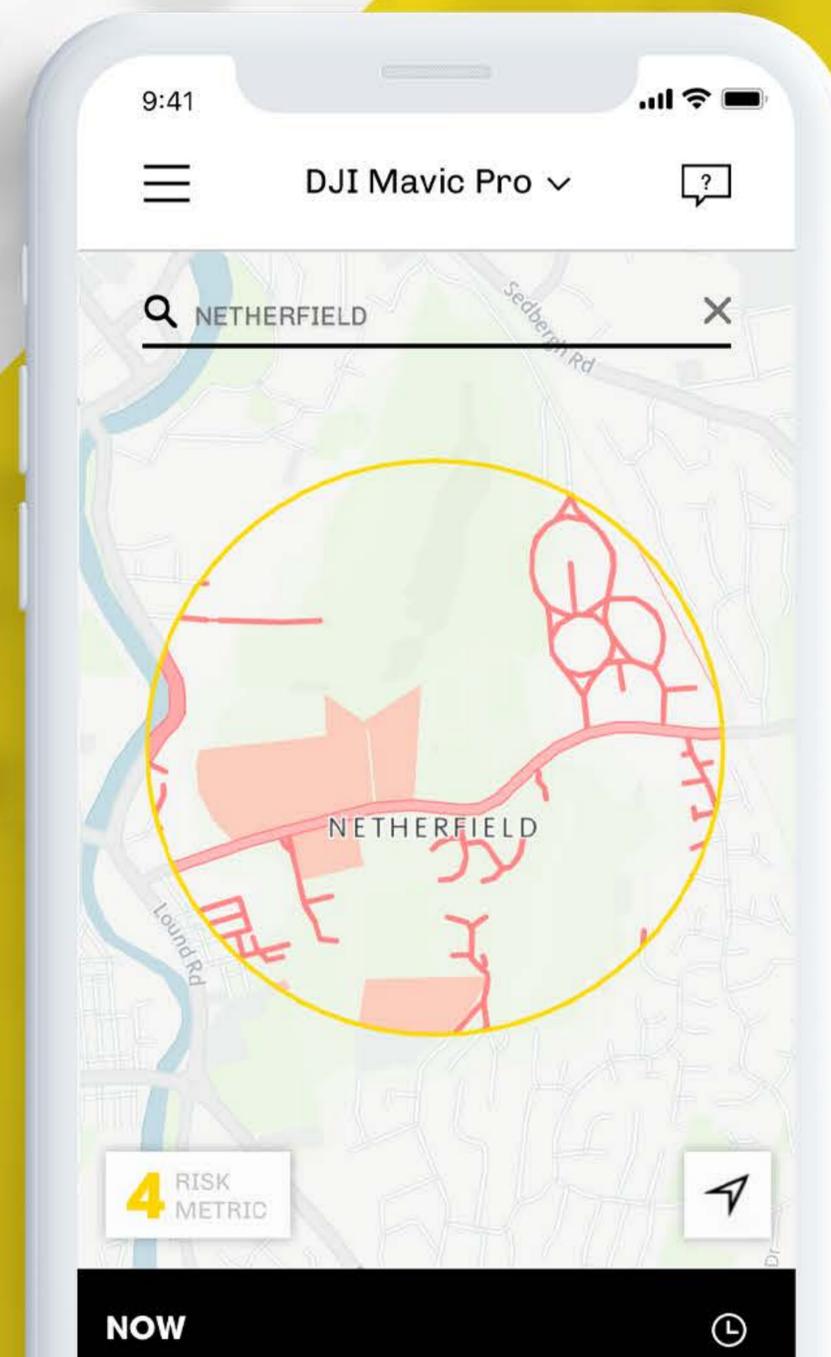
We're still in the early adoption stage of drone technology with about 10 percent of medium and large businesses using drones in the United States. These are enthusiastic adopters. The majority, more reluctant adopters will follow when use cases and ROI have been proven out and standardized by the innovators.



# FLOCK

**Simpler, smarter  
drone insurance**

**An interview with  
Ed Leon Klinger, CEO**





At Flock, we're using cutting edge data science to reinvent drone insurance from the ground up. By moving away from a traditional 'one-size-fits-all' approach to insurance, we're giving commercial drone operators more flexibility, a greater understanding of drone flight risk, and fairly priced policies based on their personalized risk profiles.

We started by breaking the mold from inflexible annual policies, launching Europe's first 'pay-as-you-fly' insurance application. By feeding large amounts of data (such as hyper-local weather conditions, population densities, drone specifications, and more) through our Risk Intelligence Engine, we unlocked the ability to do something no one else could - intelligently assess, price and insure drone risk on a per-flight basis. The benefit to our pilots is accurately priced micro-duration policies that are tailored to each and every drone flight.

What we realized pretty quickly was that in addition to insurance, this data-driven approach unlocked the ability for us to share insights about flight risks with pilots before they fly. Today, this equips thousands of our customers with the power to proactively optimize towards lower-risk flights, and save money on their insurance as a result. This 'value add' is what really differentiates our offering in the market.

We've grown a lot since launching our pay-as-you-fly product back in 2018, and have since unlocked flexible monthly subscription options along with usage-based insurance at scale with our newest product, Flock Enterprise. Flock Enterprise is the world's first insurance and risk management solution for connected drone fleets, and we're delighted to have some fantastic partners - such as inspection and surveying specialists Texo - already onboard.



Flock's Risk Intelligence Engine aggregates and analyses multiple risk factors to quantify the risk of an individual drone flight.





### What industries does your solution concentrate on?

The versatility of our risk analysis technology allows us to provide smarter insurance to the entire commercial industry - from SMEs all the way up to global drone enterprises.

We're also able to cater to every type of drone operation, from aerial photography to industrial inspection, and land surveying. We've insured some fascinating use-cases, such as BBC documentaries, search and rescue missions, and wildlife research. We also had the privilege to work with NATS and Altitude Angel on Operation Zenith - this tested the technology that is set to power the future of flight management, ensuring that drones and manned aircraft can coexist safely in our increasingly busy skies.

### Where do customers find ROI in your solution?

At a very basic level, because we're able to provide insurance by the hour, day, or month, pilots are able to only pay for the coverage they need. This results in pretty large savings when you compare it to the price of traditional annual policies they previously had to commit to.

Broader reaching ROI stems from our granular analysis of risk, which enables rich, data-driven insights to be drawn at an individual flight level. This is really valuable for pilots, because it allows them to understand the impact of their potential risk on the cost of their insurance. By actively deciding to optimize that risk (say for example flying in more favorable weather conditions), their chances of having to make a claim is lowered, avoiding disruption to their business. What's more, we reward them for doing so with cheaper policy prices, so there are multiple factors at play that serve to drive profitability.

Flock Enterprise unlocks similar ROI benefits for larger organizations with connected drone fleets. With unprecedented and actionable insights into their own risk exposures, drone enterprises can take measures to reduce their own risks down to an individual flight level, and be rewarded for it. On top of that, instead of a static annual premium, our insurance is usage-based. This means that in an organization's quieter periods (where fewer flights are taking place), premium prices drop to reflect that. This not only reduces the complexity of financial planning, but also stabilizes an organization's cash flow.





## Do you have any concrete examples of ROI you can share?

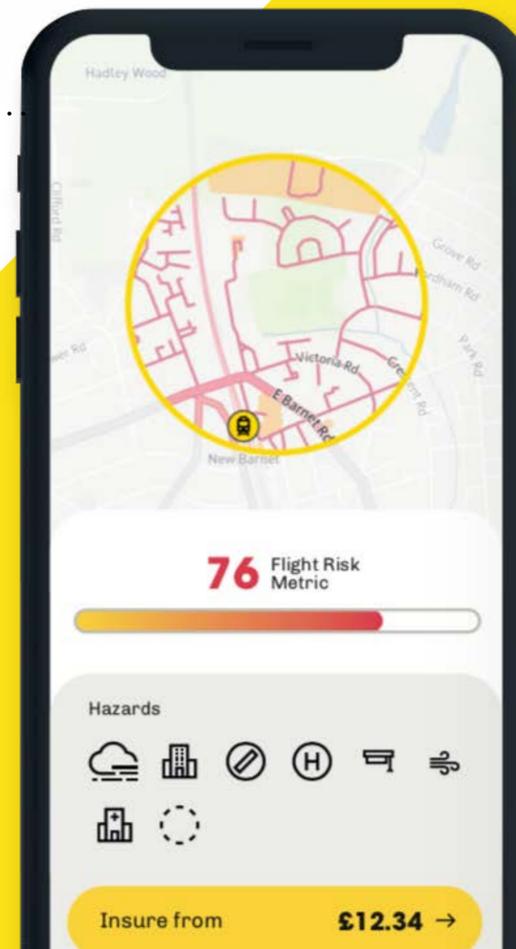
It's great to be able to say that the data we've collected from analyzing more than half a million drone flights verifies that our customers are genuinely benefitting (both financially and from a safety perspective) from our products.

Our analysis has shown that on average, our pay-as-you-fly pilots typically reduce the price of each micro-duration policy by 15% through optimizing their flight risks. They do this by comparing around 15 different risk-dependent quotes (which can be easily generated by changing the date and time of the flight, or altering the flight plan). Throughout this process, we see them choosing safer flights, typically reducing their Flight Risk Metric by 4.5 points. The lower the Flight Risk Metric, the cheaper their policy.

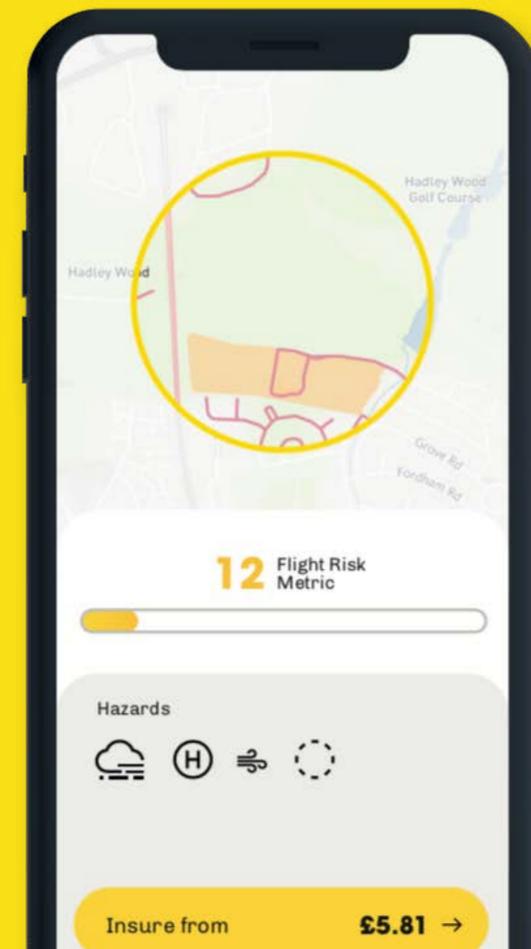
Even though Flock Enterprise is a more recent addition to our offering, we have already seen one of the world's most comprehensive and dynamic fleets of drones benefit from our innovative enterprise insurance product:



**BEFORE**  
Flight risk  
has been  
optimized



**AFTER**  
Flight risk  
has been  
optimized



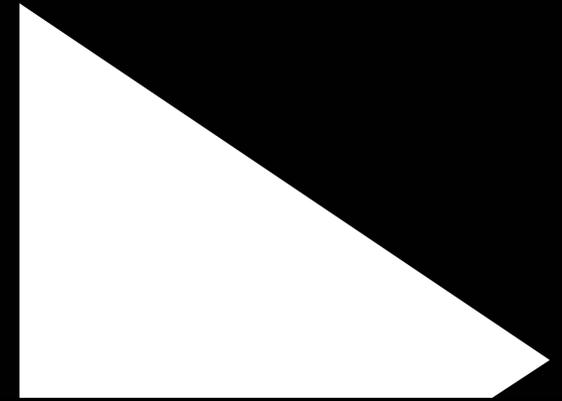


## What company that isn't in your category most excites you in the commercial drone space?

The Flock team are big fans of Zipline. It's amazing to see a company using drones to save lives day in, day out, and also solving a huge problem for developing countries without an extensive ground-based transportation infrastructure.

On top of that, Zipline are demonstrating that drone delivery can be done both safely and efficiently. This is a really important message for the industry to send out globally, as in the not-too-distant future drone deliveries are going to become commonplace in our increasingly autonomous world. To meet the demands of this societal evolution, more insurers will need to rise to the challenge of leveraging Big Data to price, insure, and help mitigate risks, contributing to a safer, smarter drone industry.





**VIDEO** INTERVIEW



**Fireside chat with  
Raff D'Andrea  
CEO of Verity Studios**

## GUINN PARTNERS

**Well, hopefully that was as informative for you as you'd hoped! As you probably noticed, what we found in our research was very promising. For a while it may seem like this industry is taking longer to scale than many of us hoped 10 years ago, we are seeing clear market indicators that scaled operations are coming in the near future. Large companies across energy, mining, surveying, construction and agriculture are all taking what were very small proof of concept drone projects a couple years ago, and rolling out much larger pilot programs to validate the scalability of these technologies. Nearly everyone we talked to at these corporations fully expect their pilots will expand into full programs over the next 18-24 months.**

**This past year has been amazing; I flew a passenger drone (it was incredible!), we've seen incredible advancements across autonomous drone stations, alternative energy sources, logistics software and hardware. I am incredibly grateful to be part of this industry and on this journey with all of you!**

***- Colin Guinn***





## THE AUTHORS

### COLIN GUINN

Colin Guinn is a product development expert and serial entrepreneur. He most recently founded Austin startup Hangar, after serving as Chief Revenue Officer at 3D Robotics and co-founding and serving as CEO of DJI North America. He is one of the most interviewed experts on robotics technology in the world, and has been featured at premier industry conferences and in countless top-rated publications and newscasts, including 60 Minutes, Techcrunch, and Fast Company. Colin's uniqueness to the business world is that he understands the technology in two dialects: the granular argot necessary to communicate with an engineer, and the simple, digestible language that's interesting to the average consumer.

[COLIN ON LINKEDIN](#)

### OREN SCHAUBLE

Oren Schauble is an experienced sales and marketing executive specializing in high-tech and disruptive products. He served as the VP of Sales and Marketing at Hangar Technology, after serving as Vice President of Marketing at 3D Robotics and Director of Marketing at TrackingPoint. Before this he worked agency-side as a creative director for lifestyle brands. Oren's specialty is in building comprehensive sales and marketing programs, managing complex social media content programs, and establishing systems for companies undergoing rapid expansion.

[OREN ON LINKEDIN](#)

### LISA COWEN

Lisa Cowen is a business development and UAV market expert, who speaks extensively with end-users and resellers throughout the commercial drone world. Lisa serves as an Associate at Guinn Partners, helping prepare and launch new unmanned systems and technology of all kinds intelligently into the market. Previously, she served in a sales capacity at Hangar Technology, extensively developing the market for aerial data in construction.

[LISA ON LINKEDIN](#)



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Guinn Partners serves discerning clients in the drones, mobility and emerging technology spaces with best in class strategy, marketing and product development.

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## HOW CAN WE HELP YOU?

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### CONSULTATION

Research, advice and strategic counsel on key decision points for product development and go-to-market.

### STRATEGY

Roadmap development, messaging and decision making and workshops with founders, executives and teams.

### DUE DILIGENCE

Industry insight, customer validation and review of materials for investments.

### STORYTELLING

Video and written content built to perform and convert.

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