WELCOME – WE’RE GLAD YOU’RE HERE!

OPEN/CLOSE CONTROL PANEL
- Click the orange arrow to maximize or minimize your control panel 1

GETTING STARTED
Join Audio
- Click the white arrow next to the word Audio 2
- Select Computer to connect through your computer speakers or headset
- Select Phone call to connect through your phone
  - Call-in information will be displayed when you select phone call.
- If you see presenters talking but do not hear audio, try changing your audio connection or leaving the meet and re-joining.
- If that doesn’t work, use the question pane to send a message to the team to let them know you are not getting sound

If joining by phone only
- Comments may be submitted after the meeting by sending an email to: Luke.Stedke@drive.ohio.gov

SUBMIT QUESTIONS/COMMENTS
- Click on the white arrow next to the word Question at the right of your screen 3
- A box will open where you can type your question/comment 4
- Click Send to submit 5
- You can use this throughout the webinar to ask questions
SMART MOBILITY IN YOUR COMMUNITY

Howard Wood
Executive Director, DriveOhio
Proven disruptive technology assets and expertise to drive innovation as we deploy new, integrated transportation systems.

Ohio Mobility Technology Ecosystem
SMART MOBILITY IN YOUR COMMUNITY

Kirk Niemeyer
City Engineer, City of Lima
DRIVE OHIO & CITY OF LIMA

Memorandum of Agreement

“Rail traffic congestion and delay to motoring public”
Technical Approach
– Design, Develop, Test, Finalize –
Various Prototypes

“this is preliminary conceptual view property of Spectrum Enterprise”
Questions?
SMART MOBILITY IN YOUR COMMUNITY

Tom Franzen
Assistant City Manager and Director of Economic Development, Springfield
Advanced Air Mobility Initiative
Springfield, Ohio

DriveOhio Alliance Webinar
Smart Mobility In Your Community

February 18, 2021
Aerospace complex featuring a general aviation airport, eVTOL Campus, UAS Range, Joint Air/Army National Guard Base and a commercial business park.

1,800 Acre Aerospace Complex

eVTOL R&D/Testing Campus

AirparkOhio

178th Wing - ISR & MQ-9 Operations Groups

9,000’ Primary Runway

5,500’ Crosswind Runway

Fly BVLOS
FAA approved airspace 225 square nautical miles up to 10,000 feet. No UAS size restriction.
Advanced Air Mobility Hub at Springfield Beckley Airport
eVTOL Industry Leaders & Agility Prime Customers
Coming to Springfield-Beckley Airport
So, why Springfield?
The National Road

• “Town at the end of the pike” 1838
• Investments in infrastructure led to westward expansion and helped Springfield become a hotbed of innovation
• Industry flourished – creating a massive manufacturing industry, largely based on the mechanization of farm implements
• Local industry resulted in new inventions and product development in farm machinery, power production, propulsion, tractors, road rollers, automobiles and trucks
In January 1904, Wilbur Wright traveled the interurban streetcar from Dayton to Springfield to meet with patent attorney Harry Toulmin.

Toulmin advised the Wrights to patent not just the mechanisms that allowed them to warp or flex a wing but to patent the idea of roll control itself.

In all, Toulmin handled 5 patent applications for the Wright brothers over a period of 17 years.
Springfield Beckley Airport History

• Opened in 1946 as part of WWII Defense Act Orders
• Supported the Ohio ANG transition to Jet Aircraft in 1962
• Supported the transition from F-84’s to F-100’s, F100’s to A-7’s and F16’s to Remotely Piloted Aircraft MQ-1/9
• Continuously upgrading infrastructure to support technology and redundancy requirements for the new mission(s)
Springfield Beckley Airport History (Continued)

• OASIS – Airspace Study Completed 2014
• Establishing UAS test ranges closer to WPAFB/AFRL to expedite technology development and reduce costs
• Airspace Integration – unmanned and manned aircraft
• Ground Based Detect And Avoid (GBDAA) radar approved in 2019 - named SkyVision
Agility Prime aims to bring together industry, investor, and government communities to establish safety and security standards while accelerating commercialization of this revolutionary technology.
AGILE
TAKE OFF and LAND like a HELICOPTER

ELECTRIC MOTORS
LOWER COST

SAFETY
PRIORITY FOR DEVELOPERS

ENGAGING WITH and INTEGRATING NEW TECH...

FAA
REVAMPS REGULATIONS to KEEP UP with THE INDUSTRY

EXCITING
and NEW

WHAT ABOUT SAFETY?
WHAT ABOUT SECURITY?

PUBLIC ACCEPTANCE

AFFORDABLE & WIDELY AVAILABLE

with MILITARY and COMMERCIAL APPLICATION

FULL DEVELOPMENT and DEPLOYMENT

MARKET WILL CHOOSE the WINNERS

REQUIRED for COMMERCIALIZATION

DEVELOPMENT OPERATIONS BEST PRACTICES INDUSTRY STANDARDS

WHEN HAMPERING INNOVATION

AGILITY PRIME

Powered by: AFWERX | theDifference.
eVTOL Industry Leaders & Agility Prime Customers Coming to Springfield-Beckley Airport
Project Underway – Phase I Infrastructure Support
Advanced Air Mobility Campus & Recharging Station

- Elevated Vertipad for eVTOL Recharging
- Flight Simulators – BETA, Joby & Lift
- eVTOL recharging on GA ramp
- eVTOL integration with GA operations
Officials break ground on new simulation facility at Springfield Airport

Mayor Copeland performs the honors of cutting the ribbon on behalf of the Agility Prime Partners
Beta Technologies
eVTOL Recharge Station (Vertipad)

Planned Components
• Elevated landing deck
• Offices, conference room, restrooms
• Battery Storage
• Generator & HVAC Unit
Advanced Air Mobility Hub

- 30,000 s.f. office and 15,000 s.f. hangar
- Establishing Vertiport Infrastructure
- eVTOL Flight Simulators
- Attracting R,D, & T and Manufacturing
- In collaboration and support of DriveOhio/FlyOhio, Agility Prime, AFWERX, AFRL, academia and private industry
Ohio Urban Air Mobility Road Map for the Future

**Crawl**
- Civilian: Smart Mobility
- Commercial: Data Collection
- Defense: UAS Integration

**Walk**
- Civilian: Aviation jobs
- Commercial: Movement of People and Goods
- Defense: UAS Group 1-5 Ops 200 sq mi - 10,000 msl

**Run**
- Civilian: Statewide UAM Ops
- Commercial: Cargo Logistics
- Defense: DOD Test Support

SkyVision

33 Smart Corridor

Vertipads

r-TWR

r-TWR Control Center

3-airport Implementation

Statewide Deployment
Advanced Air Mobility Hub at Springfield Beckley Airport

Thank You
SMART MOBILITY IN YOUR COMMUNITY

Sarah Conley-Ballew
Director of Sustainable Energy Solutions, Rural Action
The Road to ROADMAP:

How to examine rural mobility solutions with asset-based community development

Sarah Conley-Ballew, Program Director
Rural Action Sustainable Energy Solutions
ABOUT RURAL ACTION

Nestled in the foothills of Appalachian Ohio, Rural Action was founded in 1991 on the principle that locally-based, sustainable, and inclusive development is the main strategy for building resilient rural Appalachian communities.

Rural Action’s mission is to build a more just economy by developing the region’s assets in environmentally, socially, and economically sustainable ways. Together, we envision a region with clean streams and healthy forests; a place where thriving family farms, meaningful livelihoods and vibrant communities exist for everyone; with people engaged as good stewards of the world they live in and working together to make this vision a reality.

As a membership-based organization, we believe the best development is done with participation from diverse groups who have a stake in the outcome.
SUSTAINABLE ENERGY SOLUTIONS

Appalachian Ohio has a rich history providing abundant energy resources to fuel the nation’s cities and towns. Generations of hard-working coal miners proudly supported the development of modern-day America, but many communities have been left behind as the energy economy shifts away from fossil fuels in favor of cheaper and more flexible natural gas, solar and wind. As U.S. coal consumption continues to fall, power producers continue to shutter coal-fired units, impacting many Appalachian communities sustained economically by the industry.

For many years, Rural Action has supported the transition to clean and renewable energy through a number of projects and initiatives including a member-led energy committee. Smart and sustainable energy solutions are a priority for our membership, and at the end of 2016, Rural Action took an important step forward in its commitment to sustainable energy by acquiring UpGrade Ohio and establishing the Sustainable Energy Solutions Program.

Upgrade formed in 2014 as a special project of the Southeast Ohio Public Energy Council (SOPEC). Upgrade Ohio became a 501(c)3 non-profit organization in 2016, led by Sarah Conley-Bailey as Executive Director. UpGrade worked in Athens and the surrounding counties to connect people with local resources to reduce energy use and to access renewable energy solutions. Among its accomplishments, UpGrade Ohio competed in the Georgetown University Energy Prize (GUEP) through 2015 and 2016 as the official organization for Athens County. Through this effort, they helped the county reduce energy usage by nearly 3 percent, resulting in $5 million dollars in collective savings and propelling local efforts into the national spotlight. Additionally, UpGrade worked with Ohio University Credit Union to provide 0% interest loans through a hybrid and electric vehicle loan program. Through the program, 71 loans were issued.

Much of Upgrade Ohio’s work will continue as Rural Action’s Sustainable Energy Solutions (SES) Program. Through SES, Rural Action will work to support initiatives that accelerate clean energy development in Appalachian Ohio, focusing on efforts that scale up energy efficiency, renewable energy, and clean transportation initiatives.

BY THE NUMBERS

$60,699
was received by two agricultural businesses through the USDA Rural Energy for America (REAF) grant to install solar panels at their facilities. Rural Action provided grantwriting and technical assistance to both of these businesses.

75 PEOPLE
were educated about clean energy programs and technologies at three clean energy expos in Southeast Ohio.

225 HOMES
received items to help families weatherize their homes. Products given included LED bulbs, power strips, rubber-backed foam, and solar lanterns.

6 EV STATIONS
were installed in rural communities with support from Rural Action’s Sustainable Energy Program. Increasing access to fast electric vehicle (EV) charging stations will encourage more residents to buy clean energy vehicles as well as increase tourism from current EV owners.
APPALACHIAN CLEAN TRANSPORTATION
The Appalachian Clean Transportation Initiative engages a network of economic development partners, industry specialists, and statewide policy experts to plan implementation strategies that bring clean transportation infrastructure and development to Appalachian Ohio.

ROADMAP
Rural Open Access Development Mobility Access Plan (ROADMAP) is a three-year initiative funded by the Department of Energy. This project aims to pilot and study advanced vehicle technologies in a rural setting to gather information and enhance awareness of innovative mobility solutions that fill rural transportation gaps.

EV CRUISERS CLUB
The Electric Vehicle (EV) Cruisers electric car club originally started in Athens County, Ohio, in early 2016. The club acts as a hub for networking between EV owners, advocates, and enthusiasts who believe in the future of electric transportation throughout Appalachia Ohio.
ASSET-BASED COMMUNITY DEVELOPMENT

Rural Action members have a goal of more equitable development and greater opportunities for the people of Appalachian Ohio. We believe achieving this goal requires the wide adoption of sustainable systems and practices in the region.

To do this, Rural Action brings people together to understand their options and support locally derived development and decision-making.
IDENTIFYING CLEAN TRANSPORTATION PRIORITIES

WHY RURAL OHIO?

- Ohio is a microcosm of the U.S.: all four seasons, varied terrain
- Leading research teams and facilities
- AV testing authorized on all public roadways
- Almost 20% of U.S. population lives in rural areas
- 50% of roadway fatalities occur in rural areas

RURAL AREAS NATIONWIDE

- **19% of population**
  Although only 19% of the U.S. population lives in rural areas, 50% (18,590 fatalities) of all roadway fatalities occur on rural roadways in 2016.

- **50% of roadway fatalities**
  Of the 18,590 rural traffic fatalities in 2016, 27% were speed-related, 13% alcohol-related, and 89.5% of occupants were restrained—all of which are comparable to urban roadway fatalities.

- **2.5x higher roadway fatality rate by vehicle miles traveled**
  1.96 fatalities per 100M VMT in rural areas vs. 0.79 fatalities per 100M VMT in urban areas.
Rural Open Access Development Mobility Action Plan
ROADMAP Project

INDIVIDUAL MOTORIST STUDY
Understand current individual EV usage, needs, and performance and analyze motorist data to inform approaches to behavioral change

AV FEASIBILITY STUDY
Gain in-depth understanding of AV performance and limitations in rural environments to inform technology development and infrastructure investment

TRANSPORTATION SERVICE PROVIDER STUDY
Evaluate TSP performance in rural transit environment and demonstrate benefits of electrification

EV SHUTTLE PILOT DEMO
Evaluate EV performance in rural transit environment and demonstrate benefits of electrification
Reach out!

Sarah Conley-Ballew, Sustainable Energy Solutions
Program Director

740-591-1990
sarah@ruralaction.org
www.ruralaction.org
SMART MOBILITY IN YOUR COMMUNITY

Steven Hong
Ph.D, CEO and Co-Founder, Oculii
Virtual Aperture Radar

Increasing Radar Resolution up to 100X with AI Software
Autonomous Vehicles and Advanced Driving Assistance Systems must work reliably in all conditions
LIDARs are fundamentally limited by:

- Weather (Rain, Fog, Snow,...)
- Occlusions (Dust, Mud, Bird Droppings, ...)
- Limited Range (~100M)
- Cost (Single LIDAR ~ $5000 x5 = $20,000)
- Power (20W+)
- Reliability and Robustness (Mechanical/Laser Failures)

Cameras are fundamentally limited by:

- Weather (Rain, Fog, Snow, ...)
- Occlusions (Dust, Mud, Bird Droppings, ...)
- External Lighting Conditions (Evening, Direct Sun, ...)
- No direct 3D measurements (Calculated/Inferred)
- Reliance on previously trained datasets for inference
- Computing (Requires GPU/FPGA Processing)
Radar is the only sensor that works in all weather.

But Traditional Radars have very poor resolution and limited Field of View.

Improving Radar Resolution is Critical to Unlock The Commercial Viability of Autonomous Vehicles and Other Robotic Applications.
Traditional Commercial Radars are Inadequate

- Traditional Radar Waveform
  - Static Waveform that Constantly Repeats and Never Changes
- Resolution Requires More Hardware Antennas
- More Hardware Antennas Increase Cost, Size and Power Exponentially
Oculii’s Virtual AI Software Improves Resolution of Any Radar up to 100X

Dynamic Waveform that Uses AI to Learn from the Environment and Adapt

Resolution Increases with Intelligent Software

Oculii Virtual Aperture Waveform

Angular Resolution

- Standard MIMO
- Virtual Aperture Imaging (VAI)
- Raptor
- Falcon
- Eagle

# of Physical Receivers

Oculii’s Software Scales with Moore’s Law
Oculii’s Virtual Aperture Imaging Software Can Increase The Resolution of Any Radar Hardware by up to 100X

Adaptive, Phase Modulated Codes per carrier which each receiver generates different phase responses at different times – effectively Interpolates and Extrapolates the receivers, creating a “Virtual Aperture”.
High Resolution, Robust, All Weather, and **Affordable Perception** is the key to unlocking commercially viable autonomy

---

*Most L4/L5 programs initially relied heavily on optical only systems (LIDAR/Vision)*

*Today, every L4/L5 program relies on expensive “high-performance” radars, with hundreds of antennas that cost several thousands of $/unit*

---

**2014 - 2017**

- Max Speed <25 mph

**2018 - Present**

- Max Speed >75 mph
Not Just Technology – Full Stack Radar Solutions

**FALCON**
Corner Radar (Single Chip)
AVAILABLE NOW

- **20X** Performance compared to the best selling sensor in its class
- 200M range
- 120° Azimuth field of view
- 30° Elevation field of view
- 2.5 watts power consumption

---

**EAGLE**
Imaging Radar (Dual Chip)
AVAILABLE NOW

- **50X** Performance compared to the best selling sensor in its class
- 350M range
- 120° Azimuth field of view
- 30° Elevation field of view
- 5 watts power consumption

---

**RAPTOR**
Imaging Radar (Quad Chip)
A Samples Available - 2H 2021

- **100X** Performance compared to the best selling sensor in its class
- 500+ M range
- 150° Azimuth field of view
- 60° Elevation field of view
- 10-15 watts power consumption

<table>
<thead>
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<th>Resolution (Azimuth/Elevation)</th>
<th>2.0°</th>
<th>5.0°</th>
<th>Resolution (Azimuth/Elevation)</th>
<th>0.5°</th>
<th>1.0°</th>
<th>Resolution (Azimuth/Elevation)</th>
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<td>Azimuth/Elevation Resolution</td>
<td>500+ M</td>
<td>150°</td>
</tr>
</tbody>
</table>
Virtual Aperture Imaging Software Scales All Radar Architectures

**L1/2 ADAS (FALCON)**
- State of the Art
- Low Cost, Auto Grade
- Mass Manufactured Single Chip Radar

*20X Performance vs State of the Art*
*No Impact to BOM, Cost, or Manufacturing of a standard Corner Radar*

**L3 Assisted Autonomy (EAGLE)**
- State of the Art
- Multi-Chip (2) Coherent Cascade Architecture

*50X Performance vs State of the Art*
*Enables joint <1° Resolution at 1/4 the cost, size, power of a 4 Chip Cascade*

**L4/L5 Robotaxis (RAPTOR)**
- State of the Art
- Multi-Chip (4-8), Massive MIMO
- High Sampling Rate, FPGA Processing

*>100X Performance vs State of the Art*
*LIDAR-Like Performance at 1/100 the cost, size, power of an equivalent LIDAR*
Falcon
Corner Radar

240 Virtual Channels
20X Performance

200M
2° | 5°
120° | 30°

Range
Resolution (Azimuth | Elevation)
Field of View (Azimuth | Elevation)
Eagle
Front Imaging Radar

2000+ Virtual Channels
50X Performance

350M

0.5° | 1°
Resolution (Azimuth | Elevation)

120° | 30°
Field of View (Azimuth | Elevation)
360° EAGLE
Highest Resolution Automotive Radar
High Resolution Radar Point Cloud Mapping and Localization
Fused Radar + Vision AI Perception Models
Oculii’s Embedded AI Edge Processing Reduces Total Cost of Ownership by more than 1000X

Oculii VAI Radar

$  
All Weather, Cost-Effective, Low Power Perception

3D Sensor: LIDAR

$$$$$$$  
Expensive, Unproven, and Unusable in Inclement Weather

Storage: Flash Array

Petabytes of Memory to store Millions of LIDAR Points Per Second

Processing: GPU/FPGA

Massive Computation to Process Millions of LIDAR Points in Real Time

Power: 2000+W

Increased Battery Requirements and up to 30% Range Reduction
High Resolution, Robust, All Weather, Affordable Sensors

Unlock a host of Robotic Autonomous Applications outside Automotive

Outdoor

Autonomous Delivery
On Road Delivery

Aerial Drones
Non-Line of Sight Operation

Last-Mile Delivery
Food/Package Sidewalk Drive

Robotic Agriculture
Mowing, Harvesting

Marine
Assisted Docking

Heavy Industrial
Construction, Mining

Indoor

Collaborative Robots
Palletizing, Pick/Place

Logistics Robots
Order Fulfillment, Inventory

Industrial Robotics
Manufacturing

Cleaning Robots
Commercial + Personal

Retail/Healthcare Robots
Inventory, Material Handling

Forklifts/Palletjacks
Auto Pallet Handling

Confidential
Oculii is delivering scalable radar software technology that significantly enhances ADAS today and enables full Autonomous Driving in the future.