



White paper

# UAV-based airborne-to-ground 4G/5G comms

Soaring to new heights in supporting  
the warfighter and beyond



# Introduction

5G technology has boosted cellular networks, facilitated modern emergency support for first responders, and is in the process of helping transform the U.S. Department of Defense (DoD) capabilities and wireless connectivity. For the past few years now, the DoD has been working with companies such as Verizon, Omni-Response, and Cornet Technology on pilots to add airborne-to-ground 5G connectivity to aircraft or unmanned aerial vehicles (UAVs). This initiative will leverage command and control platforms and applications to provide mission critical asset and personnel management.

In 2020, recognizing the potential to leverage 5G for a number of defense roles, the DoD authorized \$600 million for 5G testing across five U.S. military sites, adding seven more with a new contract in 2021. As a result of these efforts, the incorporation of collaborative government/industry fresh solutions and possibilities through airborne readiness have been discovered that will be critical for future mission success.

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## Pilot backstory

**The Airborne-to-ground 4G/5G Communications pilots begin with equipping DoD aircraft with private 5G platforms for initial entry communications and Intelligence, Surveillance, and Reconnaissance (ISR).**

Tim Kokinda, 5G Product Director  
Cornet Technology



Each device is equivalent in cost to one SATCOM radio but can host 64 users, as well as offer more potential than a SATCOM radio. Previous ISR aircraft performed video and imagery retrieval and light detection and ranging (LiDAR) that was transmitted through satellite communications.

Jared Colvig, Solutions Architect, Verizon, explained that 5G will help enhance these capabilities as well as add an initial entry connectivity platform. Warfighters can turn on cameras remotely, disable vehicles, and control assets via a secure aerial 5G connection linked to a tactical operations center. With aircraft-based 5G, the signal radius expands from under one mile to six miles, enabling longer-range communications and new possibilities for mission-critical agencies operating in communications denied environments.

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## Creation of a private 5G wireless bubble

In the same way it connects first responders in remote locations, the DoD can apply this technology to help protect the warfighter. Private 5G networks can enhance wireless connectivity and sustain military operations in war zones and other remote locations. Information is separated so that only those completing specific tasks have access to the relevant information. Keeping limited access to different intelligence helps prevent it from falling into the wrong hands. For example, if a plane or drone goes down, the data transmitted would not be stored on the aircraft.

While the DoD is investing heavily in airborne readiness because of its significant potential for mission advantage, the value of this technology can be most clearly seen at present in domestic public safety readiness.

# Introduction

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**Firefighters who are fighting 10 different wildfires can create 10 different bubbles that connect to each location. Within the bubbles, firefighters' heart rates and electrocardiograms can be monitored with real-time connectivity for spikes in heart rate or blood oxygenation.**

**Wesley Drake, Chief Operating Officer  
Omni-Response**

Drake emphasized that this ability to communicate easily from denied environments is vitally important in ensuring public safety because, “sensor management and telemetry data [pulled] from each individual is life-saving.” A rapid removal from the environment can save the life of a frontline firefighter or warfighter.

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## Benefits of compartmentalized networks

The compartmentalized networks can also make correspondence easier at separate related events. The operators can remotely turn on specified cameras if trouble is detected, streamlining the process of gathering real-time mission critical information and protecting the mission by monitoring what is happening live. “A lot of the back-and-forth conversations that would have to take place to gain situational awareness are omitted due to the functionality of the platform and overarching network,” Drake concluded. As a result, airborne readiness aims to create hyper-enabled ground operators with minimal devices, wearing just a watch and a phone, and relying on aerial access for management and support.

Despite being relatively new, airborne-to-ground 5G communications have seen many advancements in the past couple years. Recent pilot programs have tested the technology in various situations at military sites across the country and given us a glimpse of its potential.



# Overview of completed pilots

As the world becomes increasingly reliant on technology, the need for reliable and secure communication networks has become paramount. The first part of this paper discussed how the DoD recognized this need and has been exploring ways to leverage 5G and wireless connectivity advancements to improve mission-critical communications, particularly in airborne environments. To that end, the DoD has been collaborating with technology partners to execute proof-of-concept pilots that demonstrate the capabilities of 5G networks in compromised or limited-connectivity environments.

Below is a breakdown of some of the proof-of-concept pilots previously executed for the initiative.

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## Colorado

Verizon-supported a proof of concept in Colorado. The exercise showcased an Android team awareness kit (ATAK) and situational awareness capabilities on a commercial and private 4G LTE network in a compromised or limited-to-no-connectivity environment. The goal of this exercise was to provide a complete sensory telemetry capability in a cellular bubble and to transmit vital personnel, vehicle, and asset data to an overarching hybrid C2 integration and management platform (both static and mobile) for comprehensive situational awareness with full ATAK compatibility.

The exercise was to provide for tailorable methods of transmitting data back to the tactical operations center. The demonstration highlighted the unique architecture of a mobile, commercial, and private LTE network with full communication and telemetry capabilities.

## Florida

A pilot demonstrating C2, ATAK, and situational awareness capabilities on a private LTE network was tested in a compromised or limited-to-no-connectivity environment (RF denied environment). The exercise highlighted the unique architecture of a drone-mounted, private LTE network with full communication and telemetry capabilities (to include asset command and control) backhauled via a 4G / 5G network to the Verizon network. The goal of the demonstration was to provide for complete sensory telemetry capability in a cellular bubble of more than seven kilometers and to transmit vital personnel, vehicle and asset data to an overarching hybrid C2 integration and management platform (both static and mobile) for command and control, comprehensive situational awareness with full ATAK compatibility.

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## Arctic

The DoD leveraged Verizon, Omni-Response, and Cornet Technology to enhance and provide Arctic communications in communications rich and denied environments. This solution included leveraging the commercial Verizon network when available or a private 5G network, providing the warfighter with mission critical command and control. This solution powered by Omni-Response enables the warfighter to effectively communicate over multiple networks federated on the edge compute side providing near real time remote command and control of all personnel, assets, sensors, vehicles, drones, and robotics from one platform. This solution was critical in solving communications connectivity and interoperability in any environment.

# Overview of completed pilots

## Texas

A school safety pilot was deployed in Texas for a comprehensive solution leveraging multiple organizations including Verizon and Omni-Response. This pilot provided gunshot detection, impact detection, man-down detection, drone flight, and alerting. Additionally, integration work was performed in order to bring in live video, weapon detection, auto door locks, and existing alerting into one comprehensive solution.

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## Water rescue

Omni-Response and Cornet Technology used the Verizon network to provide backhaul and interoperability between communications rich and denied environments using private and commercial 5G networks. The private networks can be linked together and the servers can be federated to provide mission critical biometrics and personnel locating information while remotely controlling all assets. This use case provided the ability to create cellular infrastructure in denied environments and enables drone and robotic flight remotely to enhance survivability and minimize pilots and operators.

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## Mission-critical communications on a drop zone

Special operations and airborne personnel can leverage the combined solution provided by Verizon, Omni-Response, and CornetTechnology. This use case provides the warfighter with the initial entry communications into a communication denied environment with all software hosted on the private network. The private 5G network is jumped by a single paratrooper and provides connectivity to 64 users simply carrying a phone and wearing a watch. This provided the commander with real-time situation awareness and command and control. The commander had visibility of the team's biometric data, location, body camera, impact, man-down detection, live two-way chat and push to talk with all users. Additionally, any user was able to remotely control all personnel, sensors, assets, drones, and robotics.

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**5G will help enhance capabilities as well as add an initial entry connectivity platform. Warfighters can turn on cameras remotely, disable vehicles, and control assets via a secure aerial 5G connection linked to a tactical operations center.**

**Jared Colvig, Solutions Architect, Verizon**



# Conclusion



The path to 4G/5G airborne-to-ground readiness involves many steps. Throughout the journey, one thing is clear: airborne readiness helps support the DoD's flexibility and is not just mission enhancing, but mission critical. The capabilities that have been identified during the pilots are helping expand capabilities both at home and overseas while helping contribute to a more secure enterprise. In the future, the military and other aspects of government can benefit greatly from 5G and wireless connectivity advancements in ways that aren't even conceivable today.

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## About Verizon

Verizon understands that federal agencies have missions that matter—delivering critical services to citizens, enabling first responders and defending the nation. Our federal customers continue to rely on our decades of experience in delivering the networks and the technology that make government work—reliably, securely, and cost-effectively.

For updates on Verizon, follow us on [LinkedIn](#), [Twitter @VerizonBusiness](#), or visit [verizon.com/defense](https://www.verizon.com/defense).

## About Omni-Response

Omni-Response is a Texas-based software solution provider specializing in systems integration technology for enterprise, government, and military applications. Our state-of-the-art telemetry solutions are customized to suit the specialized needs of our customers. Stated simply, we connect businesses and government entities with the information they need most to make everyday decisions. Our main markets and applications are in law enforcement, military, and transportation. For these customers, our all-in-one systems integration offers an unparalleled capability to monitor critical functions and systems all from one dashboard.

For updates on Omni-Response, visit [omni-response.com](https://www.omni-response.com).

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## About Cornet Technology

Founded in 1989, Cornet Technology, Inc. is a privately-held Small Business that designs, engineers, and manufactures a wide range of advanced Command, Control, Communications, Computer, Intelligence, Surveillance, and Reconnaissance (C4ISR) solutions targeted at U.S. and International Defense and Aerospace agencies and Prime Contractors. Cornet Technology products are designed, engineered, and manufactured in the USA. All design, engineering, and manufacturing are done in-house giving Cornet complete control over all aspects of product development, including test and verification, documentation, manufacturing, quality control, and service.

For updates on Cornet Technology, visit [cornet.com](https://www.cornet.com).

