

OPERATION DC GUARDIAN - WHITE PAPER

Challenges and Resolutions for Effective Interoperable Communications



January 2021

TASK FORCE DC Civil Disturbance Operations, June 2020.

In June of 2020 civil unrest throughout the United States required the collaborative response of multiple local, state and Federal agencies. In the District of Columbia, the D.C. National Guard Task Force Civil Disturbance (TFCD) was mobilized to provide command and control oversight to thousands of National Guard troops and local first responders.

Operation DC Guardian required a close a partnership with federal, state, and local law enforcement, the mayor's office, DC Homeland Security, Department of Health, JFHQ-NCR, and many other federal agencies. To accomplish coordinated interoperable communications among the partners, the ANG/A5 NEGREA selected the SyTech RIOS Radio Interoperability Gateway to enable successful interoperable communications for the agencies involved.



The key mission criteria were as follows:

- Provide interoperable communications among the provided A5 NEGREA radio assets.
- Provide interoperable communication among interagency partners utilizing radios including but not limited to Motorola APX mobile and portable radios, Harris XL 200 portable radios, SINCGARS, Harris PRC-148, Harris PRC-150/152, and Bendix King portable and mobile radios.
- Deploy to various locations offering limited space, power, and personnel resources.
- Maintain encryption for radio nets currently in operation.
- Accomplish the task in 36 hours.

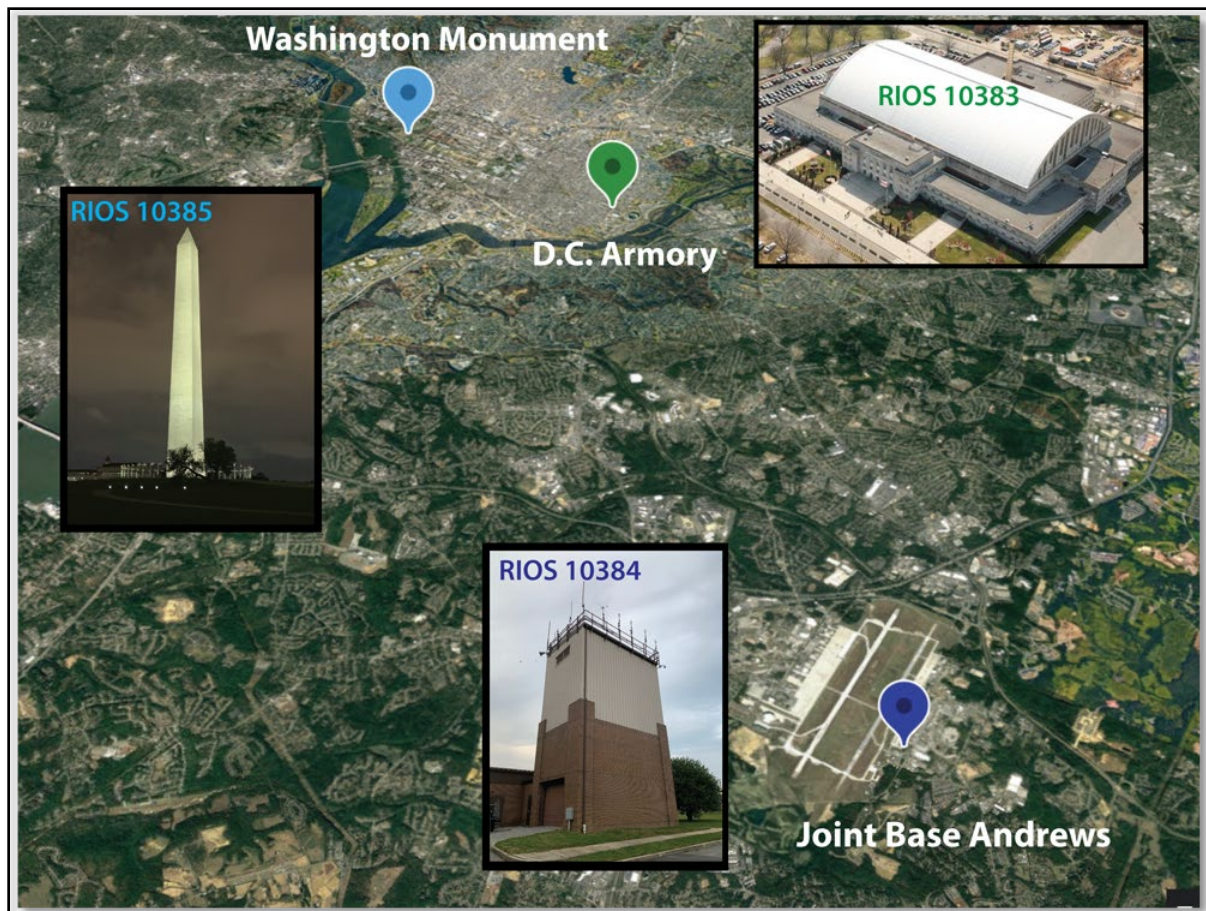
The responsibility of establishing interagency communications resided with the 113th Wing of the Air National Guard. Known as the "Capital Guardians," the 113 would be responsible for providing the radios, antennas, manpower, a communications plan, and the radio interoperability gateways required for full mission capabilities.

From their asset inventory, the 113 and the National Guard selected the SyTech RIOS for the system's portability, network versatility, and radio interfacing technology. The National Guard designated three (3) SyTech RIOS TAC2s to accommodate the proposed requirement. The RIOS TAC2s were assigned locations at the DC Amory, Joint Base Andrews and atop the Washington Monument. The following document provides an outline of challenges and resolutions to achieve full mission capabilities within the allotted 36-hour window.

MISSION CAPABILITY CHALLENGE 1: Reduce Line-of-Sight Issues Related to Radio Proximity.

The DC National Guard operates primarily on the Nation Capital Region (NCR) trunked radio system. The NCR system provides suitable range and capacity on a day-to-day basis. However, with increased traffic and stakeholders operating outside the NCR radio footprint, line-of-sight issues were an anticipated issue. Moreover, responding agencies unable to access the NCR would be limited to line-of-sight communications

To reduce the limitations of the line-of-site communications, three locations were selected for installation: The D.C. Armory, Joint Base Andrews, and the Washington Monument. Each location was provided a cache of Motorola APX and XTL mobile radios. The radios were programmed with the frequencies of the responding National Guard Units as all as other interoperability frequencies. Antenna, cables, jumpers, and radio power supplies were also provided by the 113.



The DC Armory: The DC Armory functioned as the staging point for National Guard troops and resources. Additional communication resources such as portable radios were set-up, charged, programmed by the D.C. National Guard at the Armory location. SyTech RIOS TAC2 System 10385 was stationed at the DC Armory location. The location provided access to the NCR radio trunk system, if necessary.

Joint Base Andrews: Joint Base Andrews (JBA) located in Prince George's County Maryland functions as the home base for the 113th Wing Air National Guard. SyTech RIOS TAC System 1084 was installed at the paraloft tower located near the flight line at JBA. The tower location allowed for radio antenna access to the existing antenna installations for the NGREA provided Motorola APX radios.

The Washington Monument: Through a series of authorizations from U.S Park Police, permission was granted to the National Guard to install a RIOS TAC2 system on top of the Washington Monument. SyTech RIOS TAC2, System USID 10385, was set-up and operational on the top observation platform of the Washington Monument.

- **UNIQUE SYSTEM ADVANTAGE #1: Portability with minimal equipment footprint.** The RIOS TAC2 is a portable, tactical radio gateway housed within a FAA compliant transit case. The total weight of the TAC2 is less than 40 pounds, offers a telescoping handle and wheels. The kit includes an eight-port radio interface chassis, ruggedized computer, mil-standard battery, router other components.

The portability of the RIOS TAC2 enabled the team to mobilize and set-up the system in small, difficult to reach locations that provided the system a strategic location to minimize line of sight issues related to radio range. On-board power management with options for battery power enabled the team to reduce redundant power components while operating on battery power, if needed.

RESOLUTION: The three-site configuration functioned as the first step to alleviate line of sight issues. The elevated antenna positions at the Washington Monument allowed for communications between the Armory and the Monument location. To include the JBS location however, an additional IP reachback element such as satellite or cellular connectivity would be required to achieve full mission capabilities among all three sites. The radio assets connected to RIOS allowed for communications to occur that would otherwise be hampered by limited radio range.

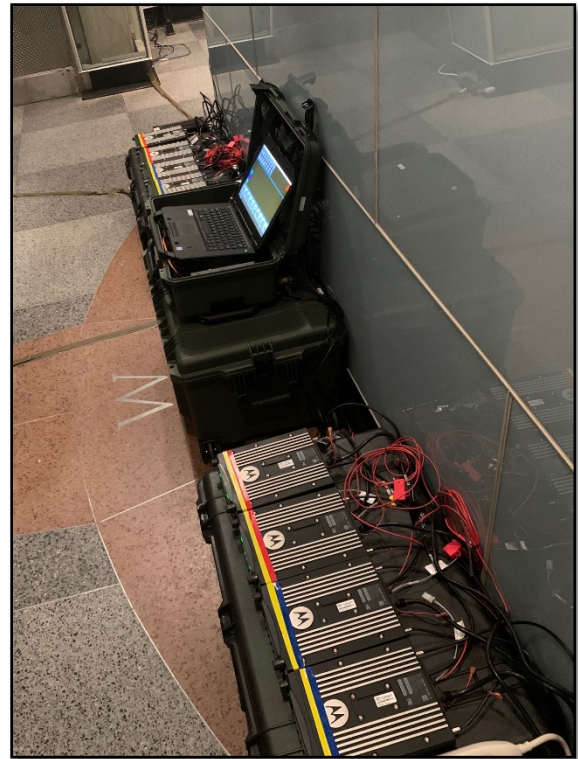
MISSION CAPABILITY CHALLENGE 2: Connect All Systems Together Across a Wireless Network

Authorities estimated that 200,000 activists would demonstrate in and around the D.C. metro area. Increased cell phone activity would likely lead to limited cellular bandwidth within the immediate area of response. Network connectivity among the systems was critical as it enable the RIOS Widearea Network to connect all systems together within a mesh network, allowing locally connected radios to be linked across the IP network to the distance RIOS TAC2 and radios. The encompassing three systems would create a virtual repeater network throughout the National Capital Region.

In response to the network capacity concerns, the team worked with AT&T to provision the RIOS TAC2 equipment for FirstNet. AT&T was able to provide a SIM cards for each of the three RIOS TAC2s. The FirstNet-enabled router integrated within the RIOS TAC2 was provisioned with AT&T and provide FirstNet SIMs were activated.

All three systems were able to successfully access FirstNet. Although FirstNet and commercially available connectivity was a challenge atop the Washington Monument, the team was able to maintain the connections throughout the course of the week. Due to multiple factors atop the Monument, signal was interrupted occasionally as a result of (1) RF interference from other radio systems permanently installed atop the monument, (2) the stone structure of the Washington Monument, (3) the possibility that the cellular connection was above the intended canopy of the cellular towers within the area.

Fortunately, the RIOS MultiSite does not require a central location to maintain the links between system. The RIOS Widearea Network functions as a mesh network whereby all systems are independent from each other, eliminating the dependence on centralized hub for widearea communications.



RIOS TAC2 atop the Washington Monument
with NGB Provided Radios

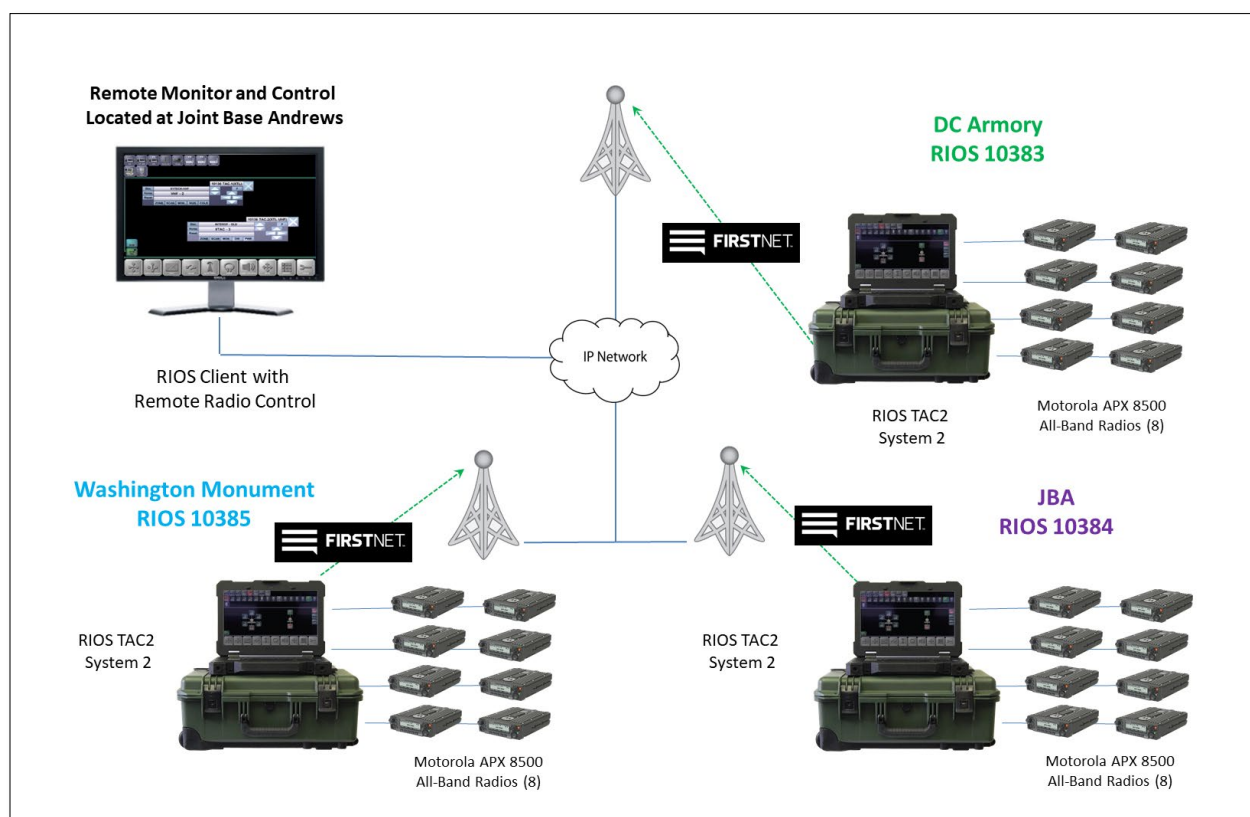
- **UNIQUE SYSTEM ADVANTAGE #2: Meshed Network Architecture.** The RIOS TAC2 is able to operate independent of network connectivity. In the event that multiple RIOS TACs are required to form a widearea network, the systems are independent to the *type* of IP link that is utilized. Methods of connectivity may include the satellite reachback, private or public networks, cellular networks such commercial cellular or FirstNet.

RESOLUTION: The utilization of FirstNet enabled the systems to operate together without the dependency of commercial cellular networks. The resulting RIOS Widearea Network enabled the radios from one location to be linked across the FirstNet network operating at a distant location, successfully eliminating line of sight issues.

Put simply, the resulting radio network created options for multiple organizations to communicate anywhere together.

MISSION CAPABILITY CHALLENGE 3: Provide Communications to and from Dozens of Agencies Operating on Multiple Channels.

The systems located at JBA, the DC Armory, and the Washington Monument each had eight (8) Motorola APX 8500s. The RIOS TAC2s at each location were connected via IP across the FirstNet network. An operator at JBA was able to communicate with the RIOS TAC2s via the RIOS Client Application. The image below illustrates the system configurations installed at each location.



RIOS TAC2 Configuration for Operation DC Guardian, June 2020

The Communication Plan for Operation DC Guardian allocated fourteen (14) Command Nets operating on the DoD National Capital Region UHF Trunking Radio System and twenty-eight (28) Tactical Nets operating on VHF, UHF, and HF radio frequencies. The combined 42 channels compassed hundreds of users including personnel from medical, aviation, Metro Police, NG JISCC, and several states including – but not limited to – Guard units from Ohio, Indiana, South Carolina, Florida, North Carolina and others.

- **UNIQUE SYSTEM ADVANTAGE #3: Remote Radio Control.** The RIOS TAC2 is able to remote steer select radios from various manufacturers. For Operation Guardian, the National Guard provided Motorola APX mobiles as the radio interfaces. The RIOS TAC2 physically connects to the APX mobile with the provided RIOS Interface Cable. Once connected, the RIOS Graphical User Interface provides

an on-screen virtual radio interface, allowing the operator to change frequencies, zones, and other configurations directly from a Windows computer. The resulting configuration allowed the National Guard to dynamically adapt when various frequencies were needed, eliminating the need for a one-to-one radio assignment for each required radio frequency. Remote radio control allows for greater operator control while reducing the equipment cost, set-up time, and on-scene personnel.

Take Away Benefits of Deploying RIOS with FirstNet Backhaul:

1. RIOS TAC2s with connected radios functioned as virtual repeaters.
2. RIOS TAC2s with crossbanding capability enabled agencies operate on dissimilar radio frequencies to communicate.
3. RIOS TAC2s with Remote Radio Control allowed operators to minimize the number of required mobile radios by channel steering radios when frequencies were required.
4. RIOS Client enabled operators to monitor and transmit on radios located throughout the region.
5. RIOS LiTE smartphone application for Android and iPhone enabled stakeholders to monitor and transmit (if necessary) on emergency response radios.



Final Notes: As result of the success mission deployment for Operation DC Guardian, the 113th National Guard Unit redeployed the three RIOS TAC2s for 59th Inauguration held in January of 2021.