



*Solutions for Advancing Communications*

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# **Mentor Radio, LLC**

## **Airport Wireless Integrated Connectivity System (AWICS)**

*AIRPORT UPGRADE PROPOSAL*



## **OVERVIEW**

Airport communications systems have grown from voice radios to encompass many different types of technologies. From operations to maintenance personnel, everyone needs more data faster. In many instances existing systems have no connectivity between them with no simple and/or cost effective way to connect them. Customers only option to increase their data throughput was to purchase an entirely new system. This is an expensive and wasteful solution.

Accessing information at airports has always been problematic. Large metal buildings are as difficult to get signals into and out of as wide open spaces. Wi-Fi dead spots result in wasted labor trying to access information along with wasted time resolving problems without time effective data. The main problem with a Wi-Fi unit is that the hardwired connection to the network is physically disassociated with the location where the wireless signals can be optimally transmitted for maximum radio effectiveness. For maximum coverage a single transmitter at a single location is not the solution. AWICS implements a multiple antenna system such that the transmitter at the existing network connection (LAN/WAN) does not radiate transmitter radio frequency (RF) power. Instead the RF power is spilt into any number of paths converted into light and sent over fiber optic cable to remote units located at optimum user locations, (inside buildings, outside buildings and scattered around the airport grounds). All remote locations convert the light signal back into RF power and radiate RF from many points. This system allows growing the coverage area by adding additional remote units and connecting with additional fiber optic cable. All this without obsolescing your initial investment or diminishing your original coverage.

## **SYSTEM COMPONENTS**

With small to mid-sized airports in mind, Mentor Radio developed a low cost integrated communications system that is both expandable in both geographic coverage and system connections to meet this need. Figure 1 shows a fully implemented Airport Wireless Integrated Connectivity System (AWICS). The AWICS consists of two elements, fixed and mobile assets. Each of these elements can be used separately or together. When used together, they provide complete connectivity across an entire airfield supporting users of many types of equipment.

## **FIXED ASSETS**

The AWICS fixed assets consist of a Radio Over Fiber (ROF) system used to distribute radio signals to multiple locations. Even over very long distances. The maximum distance from the head end unit to a remote unit may be up to 3000 meters or 1.8 miles. Extending the maximum distance is also possible. The use of fiber optics allows signals from an existing network (LAN or wireless LAN – Wi-Fi) to be ‘spread out’ over a large geographic area allowing significantly expanded coverage. Fiber optic cable supports extremely wide bandwidth. Therefore, Mentor Radio’s AWICS system can support not only Wi-Fi systems, such as 802.11b/g, but, also any other existing radio systems. (i.e. VDL Mode-2) This will allow dissimilar types of systems to be integrated into the users overall network structure while minimizing investment in new equipment.

The use of the ROF part of the AWICS extends LAN/Wi-Fi/Internet connectivity to every area of the airfield covered by remote ROF nodes. Each remote node provides coverage of a specific portion of the airfield area. Since all nodes connect to the same Wi-Fi router the entire area is connected to the



same network. This offers several advantages over a non ROF system. First, with ROF there is no added layer of network complexity. In other words, there is no need for expensive access points, controller server computers or protocol handoffs. From the users perspective, movement through the coverage area does not result in connect/disconnect or a loss of connectivity. Secondly, this increased access to real-time information saves time and improves safety.

Expanding the system is simple. In order to increase your coverage area, simply connect a head end unit and a remote antenna unit to a new fiber optic cable. A single low cost connection at the router completes the upgrade.

### **SHORT TERM AND LONG TERM BENEFITS**

Installing a fiber optic backbone at an airport provides many benefits. Optical signals are impervious to electromagnetic interference making fiber optic cable ideal for installation at airports where each taxiing aircraft is a potential source of interference. Fiber optic cable is non corrosive so signals don't degrade over time as with wired installations. Also, fiber is much less expensive to install than copper wire. With copper prices trending upwards, this can be a significant factor for future costs.

Mentor Radio's AWICS initial implementation is both low cost and simple. Benefits are immediate. As a further incentive, AWICS provides a possible revenue stream where airports can offer wireless network connectivity to corporate/business clients/tenants for access. Each AWICS remote node can be self powered with a solar panel to minimize routing power outdoors. Further, many hazardous environment locations that are radio communications prohibitive may allow ROF data communications due to the safer nature of fiber optic signals. The life expectancy of fiber is approximately 20 years. Install it today and it won't be obsolete in the future.

### **MOBILE ASSETS**

Mobile assets include base unit radios and vehicle mounted mobile radio units. These components have features that are very similar to systems that users are quite familiar with. They include AM voice radios for airport operations/ground support, FM voice radios for private communications (LMR), FM data radios for low frequency data transfer, and combination voice/data radios supporting established protocols, such as, P-25. The mobile assets will accommodate the following radio links: 118-136 MHz AM Voice, 118-136 MHz VDL Mode 2, 450-470 MHz FM Voice/Data, 450-470 MHz Tetra, 796-815 MHz Tetra, and 796-815 MHz P25. The radios will be outfitted with data interfaces that allow them to be used as 'voice and data' modems, operated via remote computers, and capable of supporting VOIP software.

### **SUMMARY**

In summary, the AWICS is a two asset system based around modular hardware that allows for complete interconnectivity at any location. Its components are traditional AM/FM voice radios, FM data radios that support multiple applications (private, P25, and Tetra), and Radio Over Fiber (ROF) systems for signal distribution for wide area, high bandwidth applications. The AWICS provides the benefits of total connectivity, increased safety, supports low cost commercial off-the-shelf (COTS) components, and it can be outfitted to support many types of user applications.





**AWICS Fixed Asset Solution**

ROF Features	ROF Benefits
<ul style="list-style-type: none"> <li>• <i>Optical Fiber Backbone</i></li> <li>• <i>Non Corrosive – Long Life</i></li> <li>• <i>Low Cost Expansion</i></li> <li>• <i>Remote Node up to 3000 Meters Connect to existing network - LAN/Wi-Fi</i></li> <li>• <i>Low Power (&lt;1W) Remote Nodes</i></li> <li>• <i>10-16VDC- xfmr or solar panel</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Connectivity over Large Geographic Areas</i></li> <li>• <i>High Data Rate Network Availability</i></li> <li>• <i>Flexible (connect Radios / LAN / WiFi / Internet)</i></li> <li>• <i>Expandable ( 1 to N remote antenna nodes)</i></li> <li>• <i>Interference Immunity</i></li> <li>• <i>Lower Cost than Copper Wires</i></li> <li>• <i>Minimizes High Cost Access Points</i></li> </ul>

**AWICS Mobile Asset Solution**

Mobile Radio Features	Mobile Radio Benefits
<ul style="list-style-type: none"> <li>• <i>Modular Transceivers (up to 2/ unit)</i></li> <li>• <i>USB Interface</i></li> <li>• <i>GPS Receiver</i></li> <li>• <i>Analog and Data Capability</i></li> <li>• <i>Programmable Output Power</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>One Package - Multiple Radios</i></li> <li>• <i>Mobile Repeater - Wireless Headsets (Bluetooth)</i></li> <li>• <i>Connect Laptops/PDA's in vehicle when no fixed asset available</i></li> <li>• <i>Vehicle Location Tracking</i></li> <li>• <i>Ground Support Radio Control</i></li> <li>• <i>External RF Power Amplifier</i></li> </ul>
Base Unit Features	Base Unit Benefits
<ul style="list-style-type: none"> <li>• <i>Supports analog voice and Data</i></li> <li>• <i>Programmable Output Power</i></li> <li>• <i>Modular Transceiver Selection (up to 6)</i></li> <li>• <i>Tri-band (VHF, UHF, 700MHz)</i></li> <li>• <i>USB and/or Ethernet Interface</i></li> <li>• <i>P25 and TETRA Capability (Future)</i></li> <li>• <i>UHF Data Capability</i></li> <li>• <i>Programmable Output Power</i></li> <li>• <i>10W, 25W, and 50W Versions</i></li> <li>• <i>Low Cost Remote Controls</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Complete Connectivity of Wireless Assets</i></li> <li>• <i>Long Range communications for AM</i></li> <li>• <i>Operation from Remote Locations</i></li> <li>• <i>Voice and data logging to external flash (USB)</i></li> <li>• <i>Redundancy – failure recovery</i></li> <li>• <i>Easily Repaired/Upgraded</i></li> <li>• <i>Backwards Compatible with Analog Systems</i></li> <li>• <i>VOIP Support</i></li> </ul>

Figure 2: AWICS Fixed Asset  
Radio Over Fiber (ROF) System

Connect the AWICS to your network using either an Access Point or wireless Router. Figure 2 shows a dual remote node configuration connected to an Access Point unit. This is ideal for existing network infrastructure implemented using access points. The AWICS can also be connected to small networks with a shared internet connection using a single wireless router.

