



## TECHNOLOGY SOLUTION

### Sensors



# Gateway Integrates Wireless Sensors with Existing Aircraft Systems at "the Speed of Software"

Architecture advances convergence of new wireless technology into preexisting systems

Innovators at NASA's Armstrong Flight Research Center have found a way to incorporate wireless sensor technology in aerospace vehicles without adding the complexity and tonnage normally associated with physically modifying existing avionics. The solution: A single universal wireless access point or "gateway" that can communicate between existing onboard systems and any subscribed wireless device. This gateway can be easily reprogrammed to communicate with any wireless device, allowing engineers to add new sensing technology "at the speed of software." Furthermore, this gateway approach means that once a wireless sensor has been tested on a research vehicle or platform, it can be immediately integrated into other vehicles outfitted with the gateway. The gateway's architecture also holds promise for other industries seeking ways to capitalize on the advantages of wireless sensors.

#### BENEFITS

- Rapid integration: Engineers can more quickly add off-the-shelf wireless sensors to existing hardwired systems.
- Reduced weight: Eliminating cabling offers dramatic weight reductions, enabling transport of more profitable payloads and/or better fuel economy.
- Lower costs: Reductions in cabling combined with decreased integration efforts make the wireless approach enabled by this gateway more economical.
- Streamlined industry infusion: Once proven on a research vehicle or platform, a wireless sensor can be immediately integrated into commercial aerospace vehicles.

#### APPLICATIONS

The technology has several potential applications:

- Testing: Aeronautic and automotive vehicles
- Systems health monitoring: Systems in long-term storage
- Industrial: Infrastructure, manufacturing, and the Internet of Things



## THE TECHNOLOGY

In traditional hardwired avionics systems, sensor integration requires installation of literally tons of physical cable that significantly increases vehicle weight and the time it takes to develop, maintain, and modify systems. Cabling also consumes space available for profitable payloads. Armstrong's technology uses software to incorporate new wireless capability without physically modifying existing avionics.

### How It Works

Armstrong's gateway uses a software defined radio (SDR) to control the flow of information between various wireless devices and a vehicle's avionics. An SDR can be reprogrammed to communicate with a variety of wireless communication protocols and frequencies via straightforward software modules—as opposed to wireless sensor-specific hardware—effectively eliminating the need to modify a vehicle's existing avionics hardware architecture.

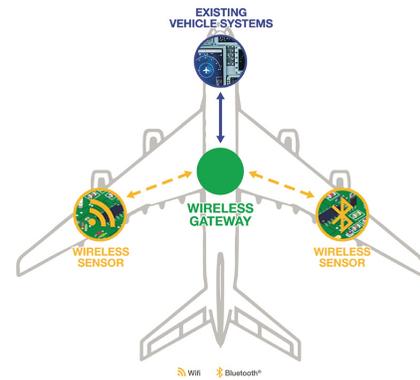
The gateway employs publish-subscribe network architecture. Before takeoff, flight computers request—or subscribe to—specific pieces of information from the SDR gateway. Wireless sensor devices then provide their respective sensor measurements to the SDR gateway, where they are distributed—or published—to any flight computer that has subscribed to a specific measurement.

### Why It Is Better

Armstrong's technology simplifies the process of designing wireless avionics networks by providing a single point of communication between wireless and wired systems. It functions as a layer of abstraction between wireless sensors and the system with which they interface. This approach also ensures that no wireless device can directly communicate with a flight computer unless subscribed prior to takeoff, thus protecting the system from malicious or errant transmissions.

Although specifically designed for aerospace systems, the gateway is both platform- and implementation-agnostic, with the potential to foster convergence between wireless technologies and existing systems in other industries. A manufacturer can add industrial Internet-of-Things capability without having to integrate new wireless interfaces into its preexisting network.

The gateway serves as a universal interface with virtually any wireless device for such applications as connected logistics, predictive maintenance, asset tracking, and much more.



This software communicates with various wireless protocols (e.g., wifi, Bluetooth®) and governs information that can reach flight computers. (The Bluetooth word mark and logo are registered trademarks of Bluetooth SIG, Inc.)

## PUBLICATIONS

Patent No: 10,931,480