U.S. Department
of Transportation
Federal Aviation Administration

Policy Statement

Subject: Installation of Wireless Local Area Network using IEEE 802.11 Protocols

Date:
June 25, 2012

Policy No:
PS-ACE-23-2

Initiated By:
ACE-100

Summary

This policy statement addresses the certification of Title 14 Code of Federal Regulations (CFR) Part 23 aircraft that include a Wireless Local Area Network (WLAN), using Institute of Electrical and Electronics Engineers (IEEE) 802.11 a/b/g/n protocols. More specifically, the policy is to clarify the guidance regarding cabin WLAN equipment installation that creates a Radio Frequency (RF) network and provides connectivity (i.e., internet connection and email services) through access point(s) to users with IEEE 802.11 compliant Portable Electronic Devices (PEDs). The primary concern of the subject WLAN certification is the aircraft systems immunity and compatibility with RF energy from transmitting PEDs (T-PEDs).

Current Regulatory and Advisory Material

The regulations applicable to the installation of WLAN using IEEE 802.11 protocols are 14 Title CFR §§ 23.1301, 23.1309(a), (b)(1), and *23.*1431(b).

The following Advisory Circulars (ACs) have guidance that is relevant to WLAN installation:

- AC 20-168, Certification Guidance for Installation of Non-Essential, Non-Required Aircraft Cabin Systems & Equipment (CS&E)
- AC 20-164, Designing and Demonstrating Aircraft Tolerance to Portable Electronic Devices
- AC 23-1309-1E, System Safety Analysis and Assessment for Part 23 Airplanes

Background and Relevant Past Practice

1. Past FAA certification projects involving WLAN systems focused on the downlink of information from satellites with limited uplink and transmission from the airplane cabin. The configuration of transmitters and receivers within the cabin was rigorously controlled and qualified to airplane installation standards.

2. The current WLAN installation involves the use of several transmitters from various consumer electronic equipment (e.g., laptop/tablet computers, smart phones, etc.) whose transmission specifications and failure modes cannot be rigorously analyzed and tested due to the unregulated use of these devices on an airplane.

3. New computer interfaces, networks and data protocols have been developed to use wireless radio-frequency (RF) links to transfer data. This allows communications without hard-wired connections. One approach uses IEEE standard 802.11a/b/g/n, which collectively is known as Wi-Fi, for wireless communication. IEEE 802.11b, g, and n use wideband digital modulation techniques in the 2400 to 2483.5 MHz band. IEEE 802.11a and n uses wideband digital modulation techniques in the 5250 to 5350 MHz and 5470 to 5825 MHz frequency bands. Wireless transmitters using IEEE 802.11a, b. g, or n protocol do not require FCC licenses and are allowed to have 1 watt transmitter power with up to 6 dBi antenna gain, which results in 4 watts Effective Isotropic Radiated Power (EIRP) in the US.

4. Safety issues related to the installation and use of the wireless RF system within the airplane include:

    - Potential interference with avionics systems whose failure conditions are classified as major or worse, or any required systems

    - Operation of PED and a wireless RF system which is not fully built to airborne equipment standards

    - Vulnerability of airplane systems to intentional or spurious emission of RF energy

5. An issue paper has been used recently to address the certification and compliance concerns related to WLAN installation and RF field strength resulting from PED usage**.**

6. AC 20-164 was published with guidance on demonstrating that aircraft and installed systems are tolerant to potential interference from portable electronic devices.

Policy

The policy points out the items to be considered, and methods acceptable to the FAA regarding the aircraft tolerance and compatibility with RF energy from T-PEDs when installing WLAN for a RF network. Figure 1 outlines the steps for certification considerations.

RTCA/DO-307, *Aircraft Design and Certification for PED Tolerance*, recognized by AC 20-164 is considered to be a preferred method of compliance to demonstrate T-PED tolerance while seeking WLAN installation approval.

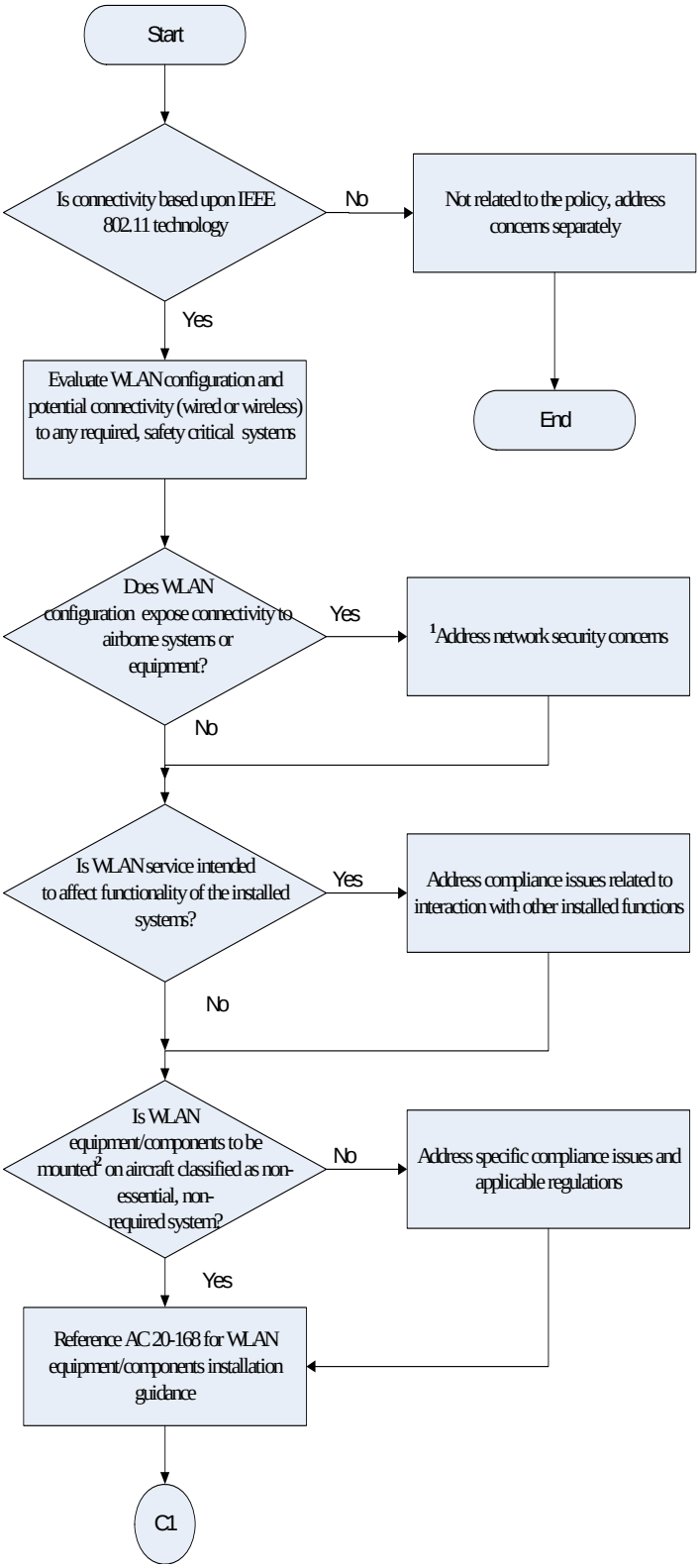

Figure 1. WLAN Installation Considerations

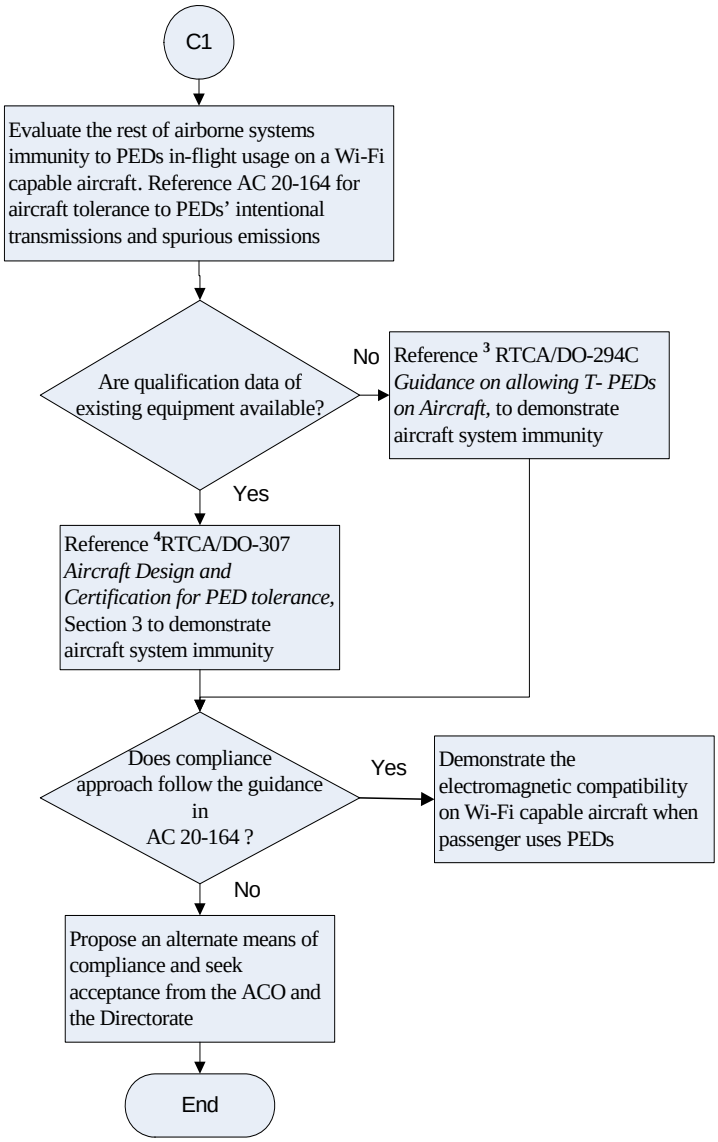

Figure 1. WLAN Installation Configurations (Continued)

1. Consider potential security threats and mitigate the malicious events.
2. If the system consists of a device that's portable, not mounted, it should be included in as part of the system evaluation. (excerpt from DO-313, *Certification Guidance for Installation of Non-Essential, Non-Required Aircraft Cabin Systems and Equipment*)
   If the wireless RF system installation includes devices that, while portable, are provided as a specific part of the installed system, these devices should be included and operated during the aircraft EMC tests. These may include wireless RF remote controls or wireless handsets provided as part of the installed system.
3. See DO-294C Appendix 6.D for ground test guidance. 14 CFR § 23.1309 and AC 23.1309-1E should be considered where 14 CFR 25.1309 and AC 25.1309-1E are referenced.
4. Reference Table 3-1 for detailed guidance.

Instructions for Continuing Airworthiness (ICA): § 23.1529

The applicant should submit an ICA associated with maintaining the aircraft systems compatibility with operation of PEDs.

Airplane Flight Manual (AFM) Limitation: § 23.1581

The limitation section of the AFM, if required, should include a statement that restricts WLAN access to its intended function, such as cabin internet connection and email services.

> Note: Any additional intended functions, where the WLAN is accessed via the equipment's IEEE 802.11 transmitters, will require a re-examination of the system's certification basis.

Effect of Policy

The general policy stated in this document does not constitute a new regulation.

Agency employees and their designees and delegations must not depart from this policy statement without appropriate justification and concurrence from the FAA management that issued this policy statement. The authority to deviate from this policy statement is delegated to the Small Airplane Directorate.

Whenever a proposed method of compliance is outside this established policy, the project aircraft certification office has to coordinate it with the policy issuing office using an issue paper. Similarly, if the project aircraft certification office becomes aware of reasons that an applicant's proposal that meets this policy should not be approved, the office must coordinate its response with the policy issuing office. Applicants should expect that certificating officials would consider this information when making findings of compliance relevant to new certificate actions. In addition, as with all guidance material, this policy statement identifies one means, but not the only means, of compliance.

Implementation

This policy discusses compliance methods that should be applied to type certificate, amended type certificate, supplemental type certificate, and amended supplemental type certification programs. The compliance methods apply to those programs with an application date that is on or after the effective date of the final policy. If the date of application precedes the effective date of the final policy, and the methods of compliance have already been coordinated with and approved by the FAA or its designee, the applicant may choose to either follow the previously acceptable methods of compliance or follow the guidance contained in this policy.

Conclusion

This policy statement is to clarify the guidance regarding WLAN equipment installation for cabin use that creates a Radio Frequency (RF) network and provides connectivity (i.e., internet connection and email service) to users with IEEE 802.11 compliant Portable Electronic Devices (PEDs).

For questions and support on this policy statement, please contact Ms. Ruth Hirt at (816) 329-4108, by fax (816) 329-4090, or by e-mail at ruth.hirt@faa.gov.

s/ Earl Lawrence

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