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McCusker

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(54) **METHOD AND SYSTEM FOR CONTROLLING ACCESS TO AN AIRCRAFT-BASED WIRELESS NETWORK**

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(73) Assignee: **Rockwell Collins, Inc.**, Cedar Rapids, IA (US)

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G06F 15/16 (2006.01)

(52) **U.S. Cl.**
USPC **726/10**; 726/2; 726/4; 726/5; 726/9

(58) **Field of Classification Search**
USPC 726/4, 9, 10, 2, 5; 244/118.5; 701/3, 701/32.6
See application file for complete search history.

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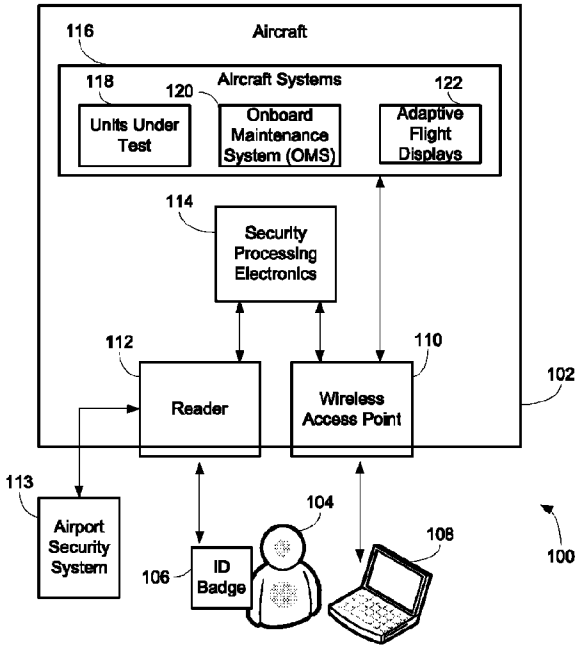
(57) **ABSTRACT**

A system for controlling access to an aircraft system by a portable electronic device attempting to connect to the aircraft system via an aircraft-based wireless network includes a reader configured to read first identification information from a first device. The system further includes communications electronics for the aircraft-based wireless network configured to receive second identification information from the portable electronic device. The system yet further includes a processing circuit configured to receive the first identification information from the reader and the second identification information from the communications electronics and to compare the first and second identification information. The processing circuit is configured to grant access to the aircraft system when the comparison indicates a match between the first and second identification information.

20 Claims, 4 Drawing Sheets



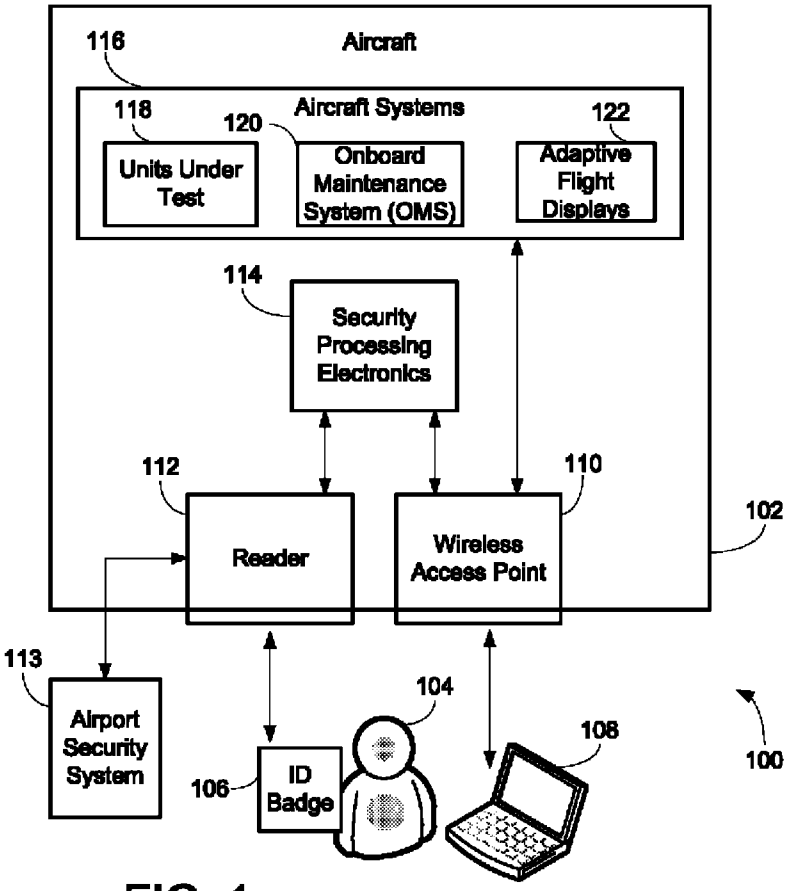

116
Aircraft
118
Aircraft Systems
120
122
Units Under Test
Onboard Maintenance System (OMS)
Adaptive Flight Displays
114
Security Processing Electronics
112
110
Reader
Wireless Access Point
102
113
Airport Security System
104
108
106
ID Badge
100

FIG. 1

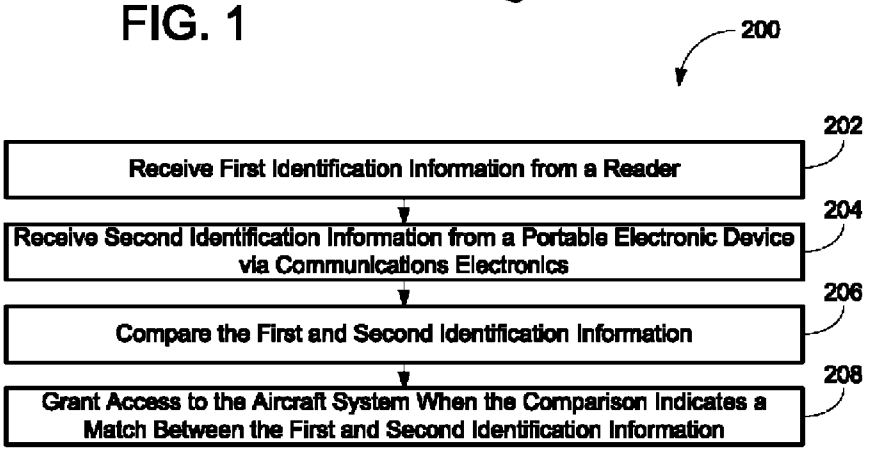

200
202
Receive First Identification Information from a Reader
204
Receive Second Identification Information from a Portable Electronic Device via Communications Electronics
206
Compare the First and Second Identification Information
208
Grant Access to the Aircraft System When the Comparison Indicates a Match Between the First and Second Identification Information

FIG. 2

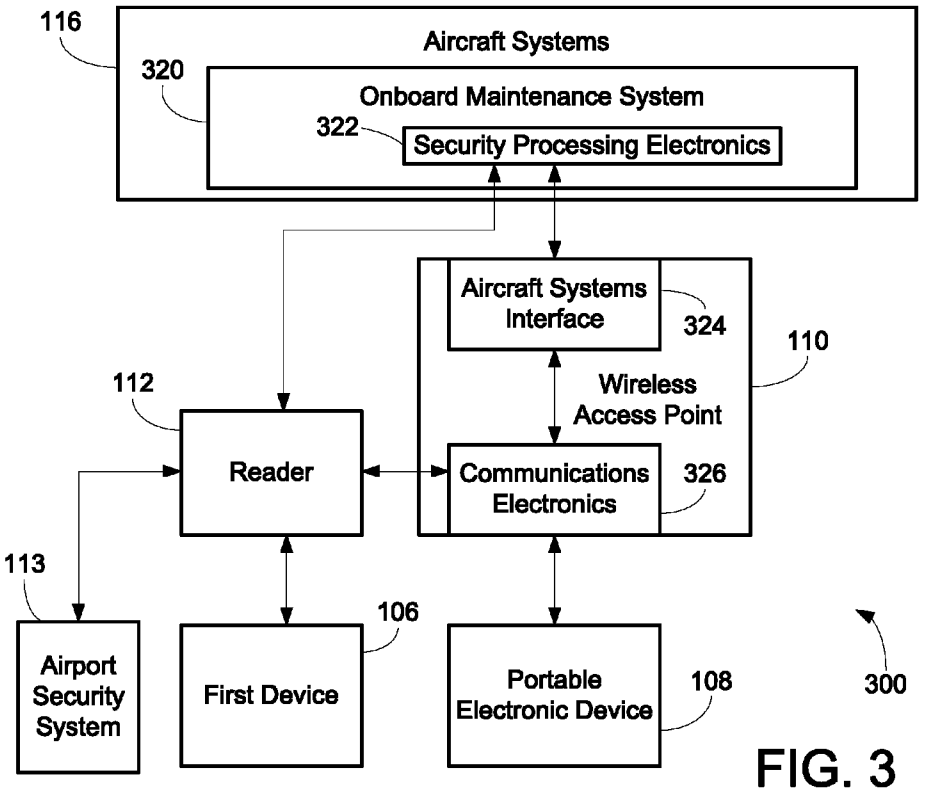

116
Aircraft Systems
320
Onboard Maintenance System
322
Security Processing Electronics
Aircraft Systems Interface
324
110
Wireless Access Point
112
Reader
Communications Electronics
326
113
Airport Security System
First Device
106
Portable Electronic Device
108
300

FIG. 3

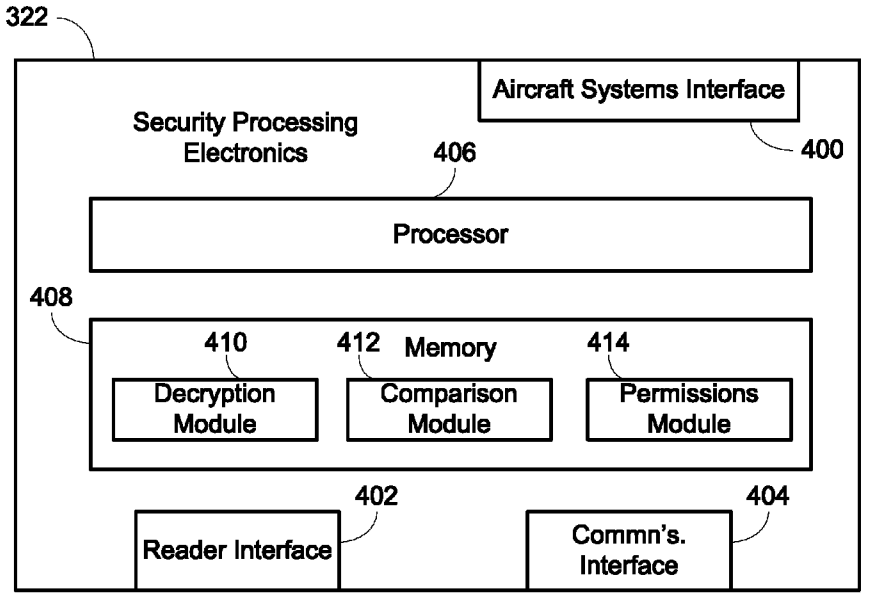

322
Aircraft Systems Interface
Security Processing Electronics
400
406
Processor
408
410
412
Memory
414
Decryption Module
Comparison Module
Permissions Module
402
404
Reader Interface
Commn's. Interface

FIG. 4

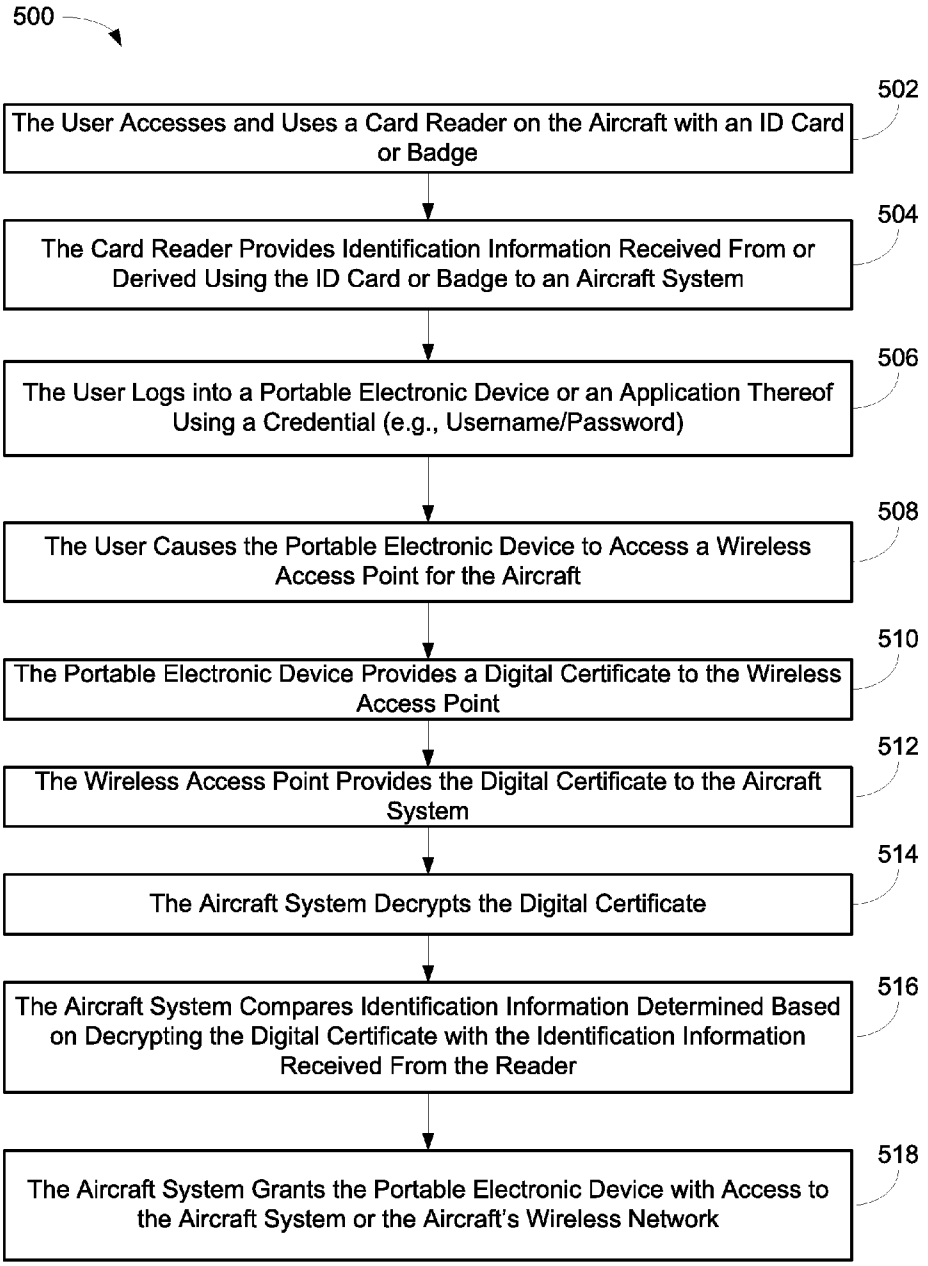

500
502
The User Accesses and Uses a Card Reader on the Aircraft with an ID Card or Badge
504
The Card Reader Provides Identification Information Received From or Derived Using the ID Card or Badge to an Aircraft System
506
The User Logs into a Portable Electronic Device or an Application Thereof Using a Credential (e.g., Username/Password)
508
The User Causes the Portable Electronic Device to Access a Wireless Access Point for the Aircraft
510
The Portable Electronic Device Provides a Digital Certificate to the Wireless Access Point
512
The Wireless Access Point Provides the Digital Certificate to the Aircraft System
514
The Aircraft System Decrypts the Digital Certificate
516
The Aircraft System Compares Identification Information Determined Based on Decrypting the Digital Certificate with the Identification Information Received From the Reader
518
The Aircraft System Grants the Portable Electronic Device with Access to the Aircraft System or the Aircraft's Wireless Network

FIG. 5

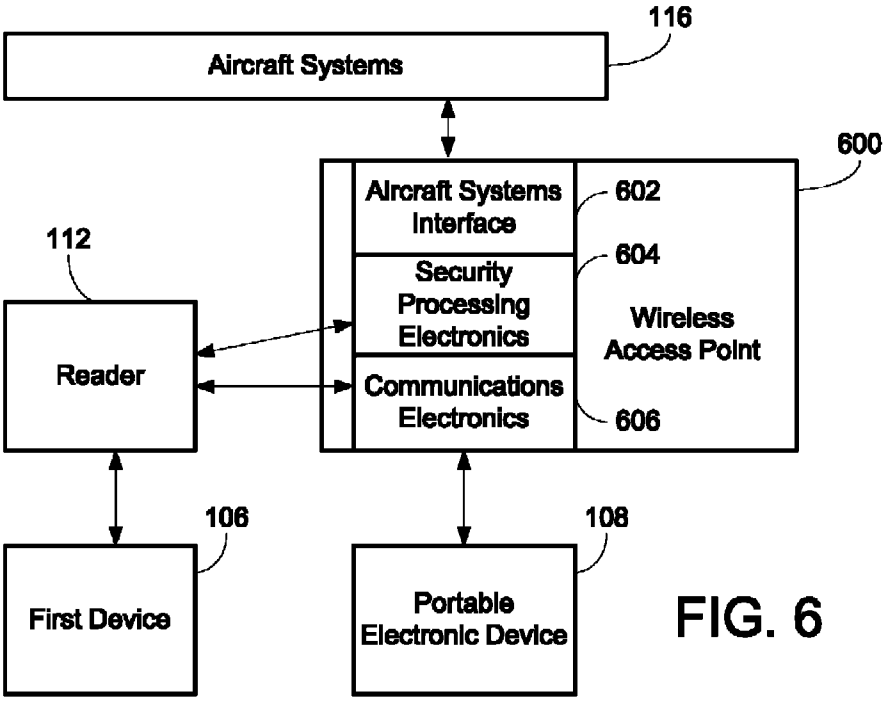

116
Aircraft Systems
600
Aircraft Systems Interface
602
112
604
Security Processing Electronics
Wireless Access Point
Reader
Communications Electronics
606
106
108
First Device
Portable Electronic Device

FIG. 6

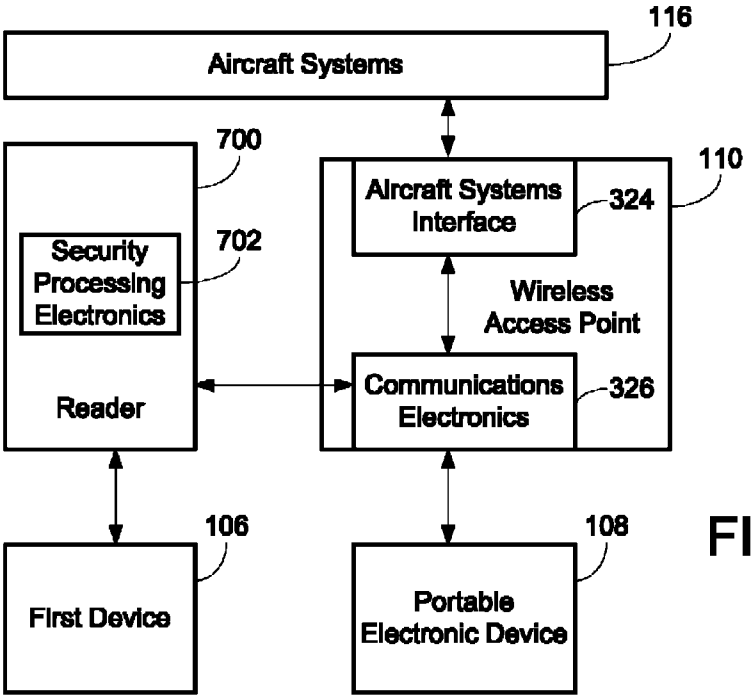

116
Aircraft Systems
700
110
Aircraft Systems Interface
324
702
Security Processing Electronics
Wireless Access Point
Reader
Communications Electronics
326
106
108
First Device
Portable Electronic Device

FIG. 7

METHOD AND SYSTEM FOR CONTROLLING ACCESS TO AN AIRCRAFT-BASED WIRELESS NETWORK

BACKGROUND

The present invention relates generally to the field of aircraft systems and aircraft-based wireless networks.

Aircraft-based wireless networks can be used to provide access to aircraft systems such as an onboard maintenance system (OMS), an adaptive flight display system (AFD), a cabin crew system, a passenger entertainment system, a hospitality inventory system, an aircraft flight plan or navigation system, and/or other aircraft systems. Applicants have found it challenging and difficult to securely authenticate, using conventional systems, the many users that may want to access aircraft systems via the aircraft-based wireless networks.

SUMMARY

One embodiment of the invention relates to a system for controlling access to an aircraft system by a portable electronic device attempting to connect to the aircraft system via an aircraft-based wireless network. The system includes a reader configured to read first identification information from a first device. The system further includes communications electronics for the aircraft-based wireless network configured to receive second identification information from the portable electronic device. The system yet further includes a processing circuit configured to receive the first identification information from the reader and the second identification information from the communications electronics and to compare the first and second identification information. The processing circuit is configured to grant access to the aircraft system when the comparison indicates a match between the first and second identification information.

Another embodiment of the invention relates to a method for controlling access to an aircraft system by a portable electronic device attempting to connect to the aircraft system via an aircraft-based wireless network. The method includes receiving, at a processing circuit, first identification information from a reader configured to read the first identification information from a first device. The method further includes receiving, at a processing circuit, second identification information from communications electronics configured to receive the second identification information from the portable electronic device. The method yet further includes using the processing circuit to compare the first and second identification information and granting access to the aircraft system when the comparison indicates a match between the first and second identification information.

Yet another embodiment of the invention relates to an apparatus for controlling access to an aircraft system by a portable electronic device attempting to connect to the aircraft system via an aircraft-based wireless network. The apparatus includes means for receiving first identification information from a reader configured to read the first identification information from a first device. The apparatus yet further includes means for receiving second identification information from communications electronics configured to receive the second identification information from the portable electronic device. The apparatus also includes means for comparing the first and second identification information. The apparatus yet further includes means for granting access to the aircraft system when the comparison indicates a match between the first and second identification information.

Alternative exemplary embodiments relate to other features and combinations of features as may be generally recited in the claims.

BRIEF DESCRIPTION OF THE FIGURES

The disclosure will become more fully understood from the following detailed description, taken in conjunction with the accompanying figures, wherein like reference numerals refer to like elements, in which:

FIG. **1** is a block diagram of a system for controlling access to an aircraft system accessible via an aircraft-based wireless network, according to an exemplary embodiment;

FIG. **2** is a flow chart of a process for controlling access to an aircraft system accessible via an aircraft-based wireless network, according to an exemplary embodiment;

FIG. **3** is a block diagram of a system for controlling access to an aircraft system accessible via an aircraft-based wireless network, according to another exemplary embodiment;

FIG. **4** is a block diagram of security processing electronics, according to an exemplary embodiment;

FIG. **5** is more detailed flow chart of a process for controlling access to an aircraft system accessible via an aircraft-based wireless network, according to an exemplary embodiment;

FIG. **6** is a block diagram of a system for controlling access to an aircraft system accessible via an aircraft-based wireless network, according to another exemplary embodiment; and

FIG. **7** is a block diagram of a system for controlling access to an aircraft system accessible via an aircraft-based wireless network, according to another exemplary embodiment.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

Before turning to the figures, which illustrate the exemplary embodiments in detail, it should be understood that the application is not limited to the details or methodology set forth in the description or illustrated in the figures. It should also be understood that the terminology is for the purpose of description only and should not be regarded as limiting.

Referring generally to the Figures, systems and methods for controlling access to an aircraft system accessible via an aircraft-based wireless network are shown and described. The systems and methods generally complete the authentication of a portable electronic device by comparing identification information of two devices a user has: (1) the portable electronic device attempting to access the network and (2) a badge, card, or other identifying device. The systems and methods may also authenticate the portable electronic device for access to the network using something the user knows (e.g., a password to the portable electronic device, a password to the network, a password to the aircraft system). In various exemplary embodiments of the present application, the system for authentication does not check user credentials received from the portable electronic device with a centralized authentication server or system remotely located from the aircraft.

Referring now to FIG. **1**, a block diagram of a system **100** for controlling access to aircraft systems **116** accessible via an aircraft-based wireless network is shown, according to an exemplary embodiment. User **104** (e.g., pilot, maintenance technician, etc.) would like to access aircraft systems **116** via a portable electronic device **108** and a wireless network provided by wireless access point **110** on aircraft **102**. For example, user **104** may be a maintenance technician desiring to access aircraft **102**'s onboard maintenance system **120**

while user **104** walks around the aircraft with portable electronic device **108**. Security processing electronics **114** are configured to grant portable electronic device **108** access to aircraft systems **116** when a comparison between first identification information received at a reader **112** matches second identification information received from portable electronic device **108** at wireless access point **110**. Accordingly, in the exemplary embodiment shown in FIG. **1**, user **104** walks up to reader **112** and scans ID badge **106** at reader **112**. Within a period of time before, during, or after the scan, when portable electronic device **108** communicates identification information for user **104** or device **108** to wireless access point **110** that matches the identification information received via ID badge **106**, security processing electronics **114** grants access to portable electronic device **108**.

Reader **112** may be configured to communicate with ID badge **106** via radio-frequency identification (RFID) technology or near-field communication (NFC) technology. In other embodiments, other short range radio communications technologies are used by reader **112**. In yet other exemplary embodiments, reader **112** is configured to communicate with ID badge **106** using visual or contact-based reading technologies (e.g., bar code scanning). Reader **112** may be located near an entrance to aircraft **102** (e.g., just inside the front most door of the aircraft, just inside a service bay), may be located in or near the cockpit, or may be located at any other location on or in aircraft **102**. While device **106** is described as being a badge, it should be appreciated that a device or circuit for providing identification information to reader **112** may be of any technology suitable with the various embodiments of reader **112**. Further device **106** may not be formed as a badge in some embodiments but may rather be formed as a patch, a button, integrated with a key fob or key, embedded on or within human skin, printed on a card or other substrate, or otherwise formed.

Reader **112** is shown in FIG. **1** as being communicably coupled to airport security system **113**. When user **104** holds his or her ID badge **106** near reader **112** so that reader **112** reads information from ID badge **106**, reader **112** may be configured to validate the information or recall additional information from airport security system **113**. For example, memory of ID badge **106** may not store an identity or identification information for user **104**. Rather, reader **112** may pass a key or unique string of information provided by ID badge **106** to airport security system **113** for looking up identification information of user **104** associated with badge **106**. In other embodiments, airport security system **113** validates ID badge **106** and returns identification information not descriptive of user **104** back to reader **112**. The identification information returned back to reader **112** from airport security system **113** may be encrypted or provided back to reader **112** in the form of a token that security processing electronics **114** can recognize.

Reader **112** is configured to provide security processing electronics **114** with identification information relating to ID badge **106** or user **104**. The information may be obtained directly from ID badge **106**, derived from ID badge **106** by logic of reader **112**, retrieved from airport security system **113**, looked up by reader **112**, or obtained in another way by reader **112**. The identification information may be provided to security processing electronics **114** in the form of a number, a string of text, an encrypted signal, a token having an encrypted portion, an XML message or other self-describing message, or in any other form.

The portable electronic device **108** for which user **104** is seeking to have access aircraft systems **116** is shown as a laptop computer in FIG. **1**. In other embodiments, portable electronic device **108** may be a personal digital assistant (PDA), a mobile phone, a tablet PC, or any other device configured to communicate with other electronic systems via wireless communications. Portable electronic device **108** may communicate with wireless access point **110** via wireless communications according to one or more wireless communications protocols (e.g., IEEE 802.11, IEEE 802.15, Bluetooth, Zigbee, WiFi, WiMax, municipal WiFi, etc.) compatible with wireless access point **110** or another wireless transceiver associated with aircraft **102**. Portable electronic device **108** may include processing electronics (e.g., processor, memory, etc.) configured to execute one or more applications that are stored local to portable electronic device **108**. In other embodiments, portable electronic device **108** may include a "thin" browser or client configured to access applications served by aircraft systems **116**, security processing electronics **114**, wireless access point **110**, or another aircraft system (e.g., a web server located on aircraft **102** and in communication with wireless access point **110**). Whether operating with a "thick" application or a "thin" client, portable electronic device **108** may be configured to prompt a user of portable electronic device **108** for identification information (e.g., a username, a personal identification number, a password, a keyphrase, an authentication code, etc.) and can send the identification information to wireless access point **110** for use (e.g., for decoding, for providing to security processing electronics **114**, etc.).

Wireless access point **110** may be or include communications electronics (e.g., transmitter and receiver, transceiver, wireless radio, etc.) configured to communicate with one or more compatible wireless devices such as portable electronic device **108** via wireless data communications. Wireless access point **110** may be configured to communicate via one or more wireless data communications protocols (e.g., Bluetooth, Zigbee, WiFi, a mobile phone protocol, one or more proprietary protocols, etc.). Wireless access point **110** can be configured to receive identification information from portable electronic device **108** and to pass the identification information to security processing electronics **114** (e.g., via an Ethernet connection, via a wireless connection, etc.). Wireless access point **110** may process identification information received from portable electronic device **108** to provide a first level of security. For example, portable electronic device **108** may be configured to provide a passcode (e.g., encrypted, unencrypted, etc.) to wireless access point **110** before wireless access point **110** will allow communications with portable electronic device **108**. In other embodiments, wireless access point **110** provides identification information received from portable electronic device **108** to security processing electronics **114** prior to allowing further wireless network communications by portable electronic device **108**. For example, wireless access point **110** may be configured to provide identification information received from portable electronic device **108** to security processing electronics **114** for matching to identification information from reader **112** prior to allowing portable electronic device **108** to "join" or otherwise regularly "connect to" wireless access point **110** or the wireless network provided or supported by access point **110**.

Security processing electronics **114** is a computer-based system configured to receive first identification information from reader **112** and second identification information received from wireless access point **110** and to compare the received identification information to authenticate portable electronic device **108** for access to aircraft systems **116**. Security processing electronics **114** may be an application server,

a web server, or another type of server onboard aircraft **102**. Security processing electronics **114** is shown in greater detail in FIG. **4**.

Aircraft systems **116** are shown to include units under test **118**, an onboard maintenance system (OMS) **120**, and adaptive flight displays **122**. Aircraft systems **116** may include other systems such as flight or cabin crew systems, cabin entertainment systems, cabin hospitality systems, avionics electronics, radar systems, communications systems, or any other aircraft system that may be accessed remotely via data communications. Units under test **118** may be or include particular aircraft components or systems that are being tested by a mechanic (e.g., user **104**, OMS **120**, a fault detection and diagnostics systems of the aircraft, portable electronic device **108**, other systems, etc.). In an exemplary embodiment, units under test **118** are communicably coupled to OMS **120** and are configured to provide signals to OMS **120** that can be used for troubleshooting, checkup, or maintenance purposes. For example, units under test **118** may include a brake system for the aircraft including one or more sensors configured to detect brake position and to make the brake position available on a wire bus in the aircraft. OMS **120** may retrieve the brake position from the wire bus and make its value available, for example, to wireless access point **110** for communication to portable electronic device **108**. Portable electronic device **108** may be configured to display the received information on a text-based or graphic-based interface so that user **104** can check or diagnose the brakes. In some embodiments OMS **120** or other aircraft systems **116** may be configured to change values or states based on data received from portable electronic device **108** via wireless access point **110**. Adaptive flight displays **122** may include cockpit avionics systems configured to provide information to pilots during flight. Adaptive flight displays **122** may be configured to make fault information, flight information for previous flights, or other information available to portable electronic device **108** via wireless access point **110** when appropriate access is granted to portable electronic device **108**.

FIG. **2** is a flow chart of a process **200** for controlling access to an aircraft system accessible via an aircraft-based wireless network, according to an exemplary embodiment. Process **200** may be an algorithm completed by, for example, security processing electronics **114** or another processing circuit located on the aircraft and configured to grant or restrict access to a wireless network, a wireless resource, or an aircraft system. The steps of process **200** may be embodied as computer code instructions on a computer readable medium (e.g., CDROM, flash memory, hard-drive based memory, solid state memory, etc.) of such a device and configured to conduct or facilitate the activities of each step when the instructions are executed by a processing circuit.

Process **200** is shown to include receiving first identification information from a reader (step **202**). The first identification information may be read from a first portable device. In other embodiments, the first identification information may be calculated or obtained (e.g., from an airport security system) based on information received from the first portable device.

Process **200** further includes receiving second identification information from a portable electronic device via communications electronics (step **204**). The communication electronics may be, for example, those of a wireless access point for a wireless network hosted by the aircraft. In some embodiments, the second identification information may be calculated by the communications electronics based on information received from the portable electronic device. For example, information received from the portable electronic device may be decrypted by the communications electronics to extract the second identification information.

Process **200** is further shown to include comparing the first and second identification information (step **206**). Access is granted to the aircraft system when the comparison indicates a match between the first and second identification information (step **208**). The comparison of step **206** can be or include activities other than a straight character-by-character comparison of the information. For example, the comparison of step **206** may include transforming one or both of the first information and the second information and comparing that transformation to the other information. For example, the first information received from the reader may be truncated, decrypted, or shifted and that transformation result may be compared to the second identification information received from the wireless access point. In another example, the comparison may include looking up another value based on either of the first information or the second information and comparing that looked up value. Accordingly, the matching of step **208** can be or include an exact character match or other levels or types of matching. For example, the matching of step **208** can include checksum matching, prefix matching, matching using one or more of the first information and the second information in a decrypting process, or by conducting any other logic configured to indicate whether the first information and the second information are related or associated in an expected or acceptable way. Granting access can mean granting access to communicate on a wireless network, to communicate via a wireless access point of the aircraft, to communicate through a gateway (e.g., the security processing electronics may be, may be a part of, or serve as the gateway), or whether to grant access in another way to the aircraft systems.

Referring now to FIG. **3**, a block diagram of a system **300** for controlling access to an aircraft system accessible via an aircraft-based wireless network is shown, according to another exemplary embodiment. In the embodiment shown in FIG. **3**, security processing electronics **322** is shown as a component of onboard maintenance system **320**. Security processing electronics **322** may interface (e.g., via a communications bus, an Ethernet network, a wireless network) with wireless access point **110** via aircraft systems interface **324** of wireless access point **110**. Wireless access point **110** is shown in greater detail relative to the version shown in FIG. **1** and is shown to include communications electronics **326**. Communications electronics **326** may be or include any of the electronics or software described above for communicating with portable electronic device **108** via wireless communications. Communications electronics **326** is also shown in communication with reader **112**. For example, reader **112** may communicate with communications electronics **326** via a wireless connection. In other embodiments, reader **112** communicates with wireless access point **110** via a wired connection. FIG. **3** illustrates that the first identification information associated with first device **106** and the second identification information associated with portable electronic device **108** may be received by security processing electronics **322** in a variety of different ways according to different embodiments of the present invention.

Referring now to FIG. **4**, a detailed a block diagram of security processing electronics **322** from FIG. **3** is shown, according to an exemplary embodiment. Security processing electronics **322** is shown to include an aircraft systems interface **400**, a processor **406**, memory **408**, a reader interface **402**, and a communications interface **404**.

Aircraft systems interface **400** is a terminal, circuitry, software or combination thereof for communicating with one or more aircraft systems. For example, aircraft systems interface **400** may include a service for sending and receiving communications on an aircraft data network (ADN), an avionics full-duplex switched Ethernet (AFDX) network, an ARINC network, an Ethernet network, etc.

Processor **406** may be a general or specific purpose processor configured to execute computer code or instructions stored in memory **408** or received from other computer readable media (e.g., CDROM, network storage, a remote server, etc.). Memory **408** may be RAM, hard drive storage, temporary storage, non-volatile memory, flash memory, optical memory, or any other suitable memory for storing software objects and/or computer instructions. When processor **406** executes instructions stored in memory **408** for completing the various activities described herein, processor **406** generally causes security processing electronics **322** to complete such activities. Modules **410**, **412**, and **414** within memory **408** may be scripts, functions, executables, or other sets of computer code or instructions for execution by processor **406**. When executed, modules **410**, **412**, and **414** configure processor **406** or more generally security processing electronics **322** for the activities described herein. Decryption module **410**, for example, is configured to decrypt communications received at aircraft systems interface **400**, reader interface **402**, and/or communications interface **404**. Comparison module **412** is configured to receive or otherwise access the first identification information received at reader interface **402** and the second identification information received at communications interface **404** and to conduct the comparison of the information (e.g., as described with reference to process **200** shown in FIG. **2**, etc.). Permissions module **414** is configured to check identification information received from either or both of reader interface **402** and communications interface **404** for whether the identified user is permitted to access the wireless network, aircraft systems, or other resources. In some embodiments permissions module **414** may not be configured to provide different sets of permissions for different particular users but may rather be configured to identify a user as being associated with a permissions group. For example, a "pilot" group may be granted different access to avionics information than a "pre-flight inspector" group. It should be noted that other modules may be stored in memory **408** for executing one or more of the activities described in the present application.

Reader interface **402** may be any set of hardware or software jacks, terminals, circuitry, software or any combination thereof for receiving data from reader **112**. For example, reader interface **402** may be an Ethernet-based interface, an optical/digital interface, an analog interface, a USB interface, or any other suitable interface for receiving data from the types of readers described above or from a network between the reader and security processing electronics **322**. Communications interface **404** may be an Ethernet interface, an avionics bus, an optical/digital interface, or any other suitable interface for communicating with, for example, a network in the aircraft, a wireless access point in the aircraft, or other communications electronics configured to receive information from portable electronic device **108**.

Referring now to FIG. **5**, a detailed flow chart of an exemplary process **500** for controlling access to an aircraft system accessible via an aircraft-based wireless network is shown, according to an exemplary embodiment. Process **500** is shown to include a user accessing and using a card reader on the aircraft with an ID card or badge (step **502**). The reader uses information from the card or badge (or obtained in conjunction with another system such as an airport security system) to provide identification information to an aircraft system (e.g., a security processing system, an aircraft communications gateway, an aircraft wireless access point, etc.) (step **504**). The user then logs into a portable electronic device or an application thereof using one or more credentials (e.g., a username and password combination) (step **506**). This user may then use an application (e.g., an aircraft service application, a connection manager, etc.) to access a wireless access point for the aircraft (step **508**). This access may include the portable electronic device providing a digital certificate, encrypted key, or another credential to the wireless access point (step **510**). The wireless access point may decrypt the digital certificate using its circuitry or may pass the digital certificate to another aircraft system (e.g., communications gateway, OMS, security system, etc.) for processing and decryption (step **512**). If the digital certificate is provided to another aircraft system such as security processing electronics, the aircraft system decrypts the digital certificate (step **514**). The aircraft system (e.g., security processing system, OMS, communications gateway, etc.) then compares identification information determined from the digital certificate with identification information received from the reader (step **516**). If the identification matches (or otherwise correlates in a way to indicate authentication), the aircraft system grants the portable electronic device with access to the aircraft system or the aircraft's wireless network (step **518**).

While some embodiments described herein relate to a maintenance provider accessing the aircraft network or an aircraft system to perform maintenance tasks, it should be noted that access to many different types of networks and systems may be controlled according to the present invention. For example, a system of the present invention may be used to control access to aircraft avionics systems or other aircraft systems by a flight crew member carrying a portable electronic flight bag (e.g., a laptop computer, a custom "netbook", a personal digital assistant, etc.). In such an embodiment, the reader may be located, for example, in or near the cockpit. The "badge" read by the reader may be an identity card, a key fob or other object/device that only an authorized flight crew member should have. In another example, a system of the present invention may be used to control access to cabin controls such as cabin lighting. In this example, the cabin crew may carry remote controls, personal digital assistants, or other portable electronic devices for interacting with one or more cabin control systems (e.g., a lighting system, a ventilation system, an entertainment system, a cabin education/safety media system, a warning light system, a cabin announcement system, a security alert system, etc.). A reader for the cabin crew may be located near a cabin door, a cabin service area, in the cockpit, or near another location of the aircraft. Yet further, a system of the present invention may be used to control access to onboard fuel systems or catering systems that are accessed by third party service providers. In such a system, the reader may be located near or on the exterior of the aircraft, in a service bay, near a catering lift, or otherwise.

Referring now to FIG. **6**, a block diagram of a system for controlling access to an aircraft system accessible via an aircraft-based wireless network is shown, according to another exemplary embodiment. In the system shown in FIG. **6**, the security processing electronics **604** are integrated with a wireless access point **600** and closely coupled to aircraft systems interface **602** and communications electronics **606**. Security processing electronics **604** may be configured to prevent access beyond wireless access point **600** to portable electronic device **108** unless credentials are matched with

those from reader **112**. Reader **112** may communicate directly with security processing electronics **604** (e.g., via a standard or proprietary wired connection) or communicate with security processing electronics **604** via communications electronics **606**.

Referring now to FIG. **7**, a block diagram of a system for controlling access to an aircraft system accessible via an aircraft-based wireless network is shown, according to another exemplary embodiment. In the system shown in FIG. **7**, the security processing electronics **702** are integrated or closely coupled to reader **700**. In this embodiment, attempted accesses by portable electronic devices result in identification information being sent from wireless access point **110** to security processing electronics **702** and reader **700** for checking against identification received at reader **700**. It should be noted that architectures beyond those shown in the Figures may be provided without departing from the scope of the present disclosure or the appended claims.

The construction and arrangement of the systems and methods as shown in the various exemplary embodiments are illustrative only. Although only a few embodiments have been described in detail in this disclosure, many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.). For example, the position of elements may be reversed or otherwise varied and the nature or number of discrete elements or positions may be altered or varied. Accordingly, all such modifications are intended to be included within the scope of the present disclosure. The order or sequence of any process or method steps may be varied or re-sequenced according to alternative embodiments. Other substitutions, modifications, changes, and omissions may be made in the design, operating conditions and arrangement of the exemplary embodiments without departing from the scope of the present disclosure.

The present disclosure contemplates methods, systems and program products on any machine-readable media for accomplishing various operations. The embodiments of the present disclosure may be implemented using existing computer processors, or by a special purpose computer processor for an appropriate system, incorporated for this or another purpose, or by a hardwired system. Embodiments within the scope of the present disclosure include program products comprising machine-readable media for carrying or having machine-executable instructions or data structures stored thereon. Such machine-readable media can be any available media that can be accessed by a general purpose or special purpose computer or other machine with a processor. By way of example, such machine-readable media can comprise RAM, ROM, EPROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to carry or store desired program code in the form of machine-executable instructions or data structures and which can be accessed by a general purpose or special purpose computer or other machine with a processor. When information is transferred or provided over a network or another communications connection (either hardwired, wireless, or a combination of hardwired or wireless) to a machine, the machine properly views the connection as a machine-readable medium. Thus, any such connection is properly termed a machine-readable medium. Combinations of the above are also included within the scope of machine-readable media. Machine-executable instructions include, for example, instructions and data which cause a general purpose computer, special purpose computer, or special purpose processing machines to perform a certain function or group of functions.

Although the figures may show a specific order of method steps, the order of the steps may differ from what is depicted. Also two or more steps may be performed concurrently or with partial concurrence. Such variation will depend on the software and hardware systems chosen and on designer choice. All such variations are within the scope of the disclosure. Likewise, software implementations could be accomplished with standard programming techniques with rule based logic and other logic to accomplish the various connection steps, processing steps, comparison steps and decision steps.

What is claimed is:

1. A system for controlling access to an aircraft system by a portable electronic device attempting to connect to the aircraft system via an aircraft-based wireless network, the system comprising:

a reader configured to read first identification information from a first device, the first device and the first identification information associated with a user of the portable electronic device;

communications electronics for the aircraft-based wireless network configured to receive a digital certificate associated with second identification information from the portable electronic device, the second identification information identifying the portable electronic device; and

a processing circuit configured to receive the first identification information from the reader and the second identification information from the portable electronic device via the communications electronics and to compare the first and second identification information;

wherein the processing circuit is configured to grant access to the aircraft system in response to a match of the first and second identification information, wherein the portable electronic device requires a user name and password for provision of the digital certificate, wherein the portable electronic device provides the digital certificate to the communications electronics, the processing circuit performing decryption using the digital certificate to obtain the second identification information.

2. The system of claim **1**, wherein the user causes the second identification information is transmitted to the communications electronics from the portable electronic device in an encrypted message; and

wherein the processing circuit is further configured to decrypt the encrypted message to obtain the second identification information.

3. The system of claim **2**, wherein the encrypted message is a digital certificate.

4. The system of claim **3**, wherein the communications electronics are configured to check credentials received from the portable electronic device before accepting and decrypting the digital certificate.

5. The system of claim **1**, wherein the processing circuit does not communicate with another authentication system to determine whether the portable electronic device should be allowed to access the aircraft system.

6. The system of claim **1**, wherein the reader is configured to communicate with the first device via at least one of radio-frequency identification (RFID) and near field communication (NFC) technology.

7. The system of claim **1**, wherein the reader is in communication with airport security system, wherein the airport

security system receives a key from the first device and provides the first identification information to the reader in response to the key.

8. The system of claim **1**, wherein the processing circuit is integrated with at least one of the aircraft system, the communications electronics, and circuitry associated with the reader and the reader is at least one of a card or badge reader and wherein the first device is at least one of a card and badge with passive or active circuitry.

9. The system of claim **1**, wherein the communications electronics comprise a wireless access point for the aircraft-based wireless network and are configured to communicate via an IEEE 802.11 compatible protocol and the portable electronic device is at least one of a laptop computer, a mobile phone, and a personal digital assistant.

10. The system of claim **1**, wherein the first information includes a token recognized by an airport aircraft security system associated with the processing circuit.

11. A method for controlling access to an aircraft system by a portable electronic device attempting to connect to the aircraft system via an aircraft-based wireless network, the method comprising:

receiving, at the processing circuit, first identification information from a reader configured to read the first identification information from a first device, the first device and the first identification information associated with a user of the portable electronic device;

receiving, at a processing circuit, second identification information from communications electronics configured to receive a digital certificate associated with the second identification information from the portable electronic device, the second identification information associated with the portable electronic device;

using the processing circuit to compare the first and second identification information; and

granting access to the aircraft system in response to a match of the first and second identification information, wherein the portable electronic device requires a user name and password for provision of the digital certificate, wherein the portable electronic device provides the digital certificate to the communications electronics, the processing circuit performing decryption using the digital certificate to obtain the second identification information.

12. The method of claim **11**, wherein the second identification information is transmitted to the communications electronics from the portable electronics device in an encrypted message; and

wherein the method further comprises decrypting the encrypted message to obtain the second identification information.

13. The method of claim **12**, wherein the encrypted message is a digital certificate.

14. The method of claim **13**, wherein the communications electronics are configured to check credentials received from the portable electronic device before at least one of accepting and decrypting the digital certificate.

15. The method of claim **11**, further comprising:

at the portable electronic device, requesting a credential from a user via a graphical user interface.

16. The method of claim **15**, further comprising:

checking the credential at the portable electronic device prior to allowing the user to further access the portable electronic device.

17. The method of claim **16**, further comprising:

checking the credential at the processing circuit prior to comparing the first identification information to the second identification information.

18. The method of claim **17**, further comprising:

at the processing circuit, receiving a digital certificate from the portable electronic device via the communications electronics; and

at the processing circuit, decrypting the digital certificate using the credential.

19. The method of claim **15**, wherein the credential comprises at least a password for the user, a password for the aircraft-based wireless network, and a password for the aircraft system.

20. An apparatus for controlling access to an aircraft system by a portable electronic device attempting to connect to the aircraft system via an aircraft-based wireless network, the apparatus comprising:

means for receiving first identification information from a reader configured to read the first identification information from a first device, the first device and the first identification information associated with a user of the portable electronic device;

means for receiving second identification information from communication electronics configured to receive a digital certificate associated with the second identification information from the portable electronic device, the second identification information associated with the portable electronic device;

means for comparing the first and second identification information; and

means for granting access to the aircraft system when the comparison indicates a match between the first and second identification information, wherein the portable electronic device requires a user name and password for provision of the digital certificate, wherein the portable electronic device provides the digital certificate to the communications electronics, the processing circuit performing decryption using the digital certificate to obtain the second identification information.

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