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(54) **SYSTEM AND METHOD FOR SELECTIVELY ENABLING A CONTROL SYSTEM**

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This patent is subject to a terminal disclaimer.

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G08B 21/00 (2006.01)

(52) **U.S. Cl.** **340/945**; 340/5.82; 701/14

(58) **Field of Classification Search** 340/945, 340/5.82-5.83, 439, 575, 576; 701/14

See application file for complete search history.

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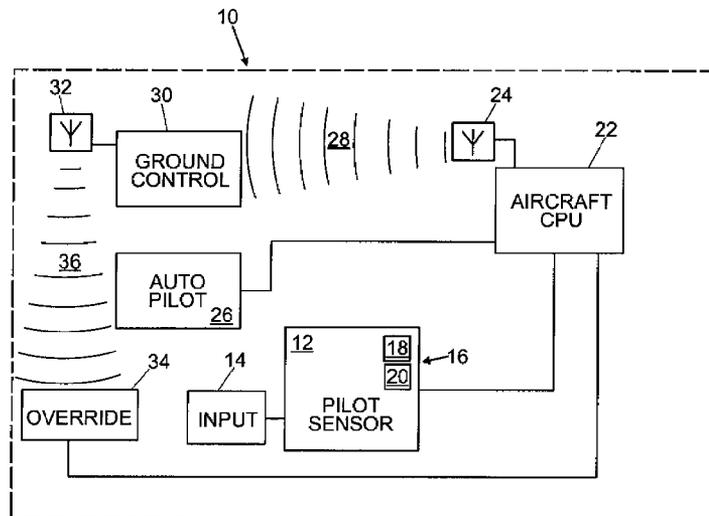
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(57) **ABSTRACT**

A system and method are disclosed for selectively enabling a control system using a biometric and a physiological sensor to determine the status of an operator. An input component is operatively coupled to the sensor to permit an operator to initialize the sensor. A central processor unit is operatively coupled to the operator sensor and the central processor unit has a transceiver operatively coupled therewith for processing and evaluating the biometric and physiological information. A ground control located remotely from the operator is operatively coupled to the central processor unit and includes a transceiver coupled therewith. An override is operatively coupled to the ground control and central processor unit.

20 Claims, 3 Drawing Sheets



US 8,138,951 B2

Page 2

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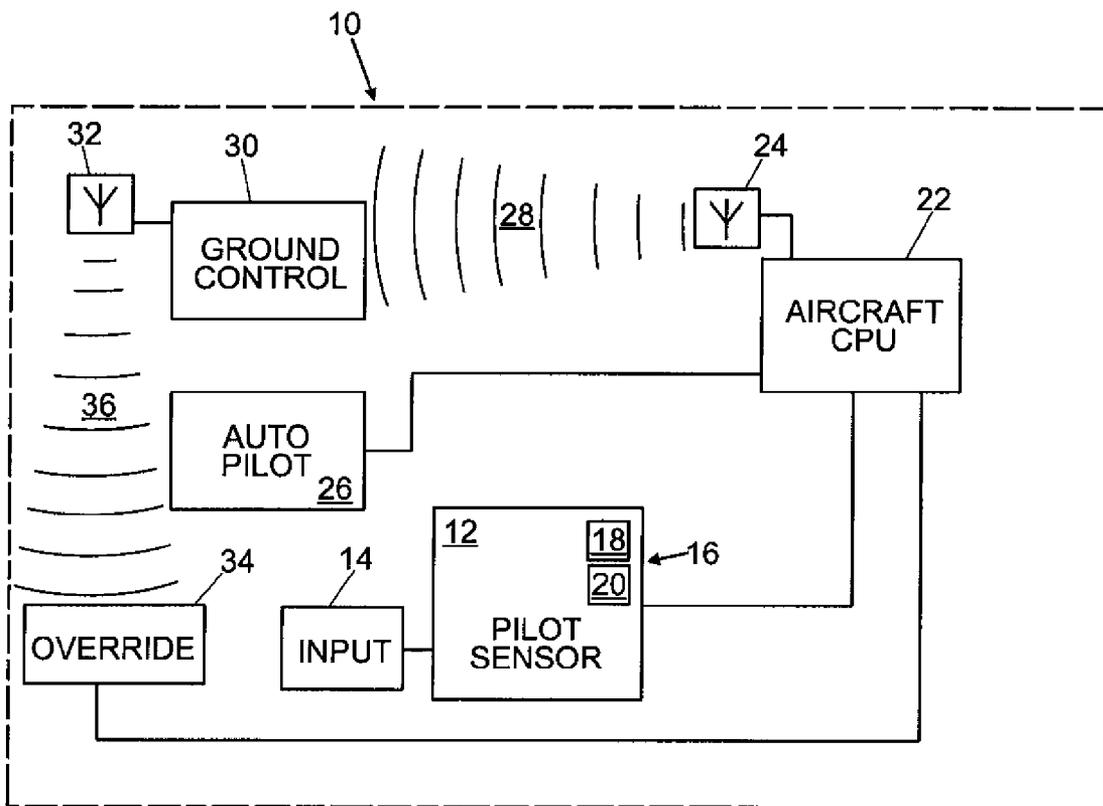


FIG. 1

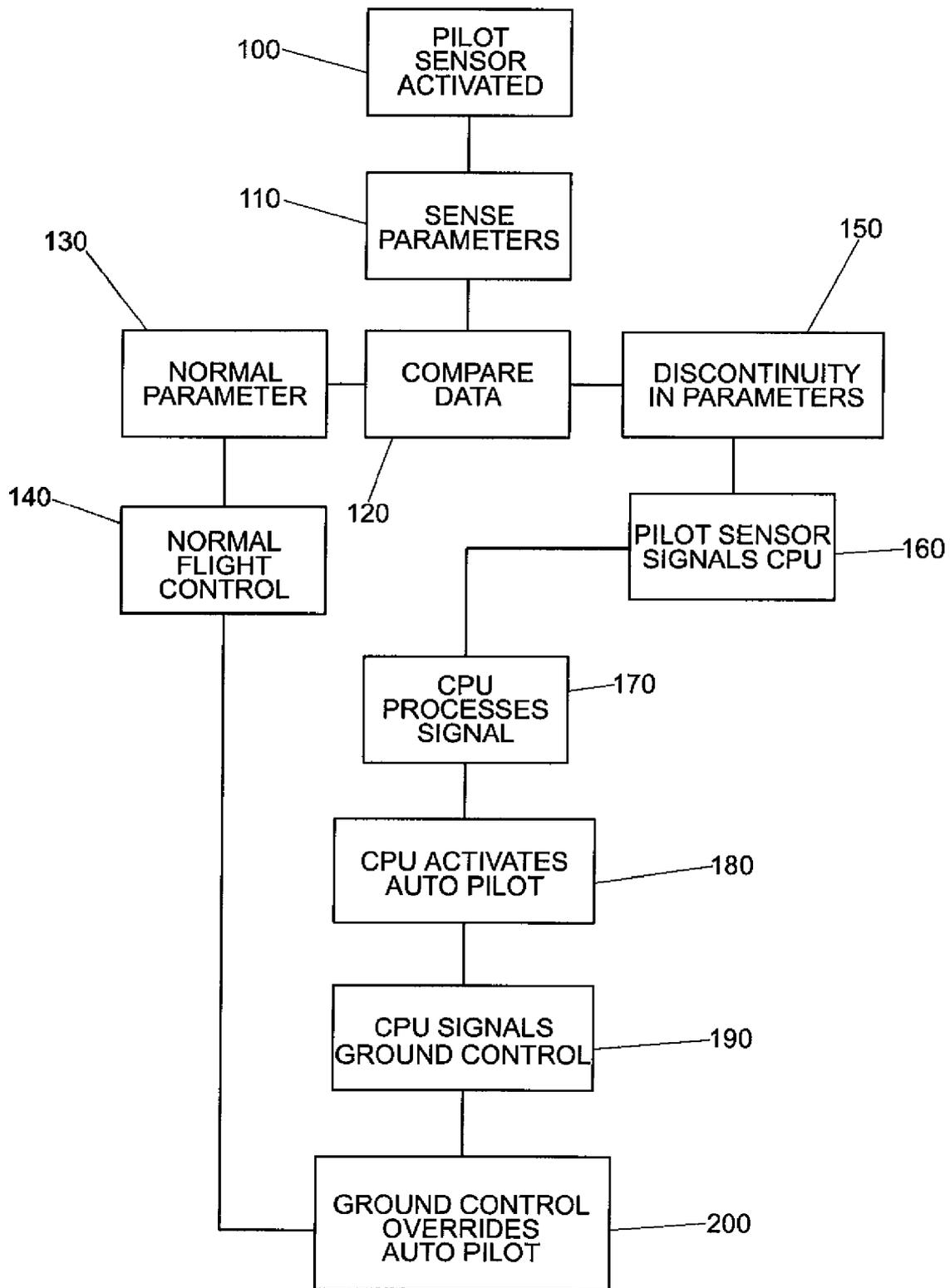


FIG. 2

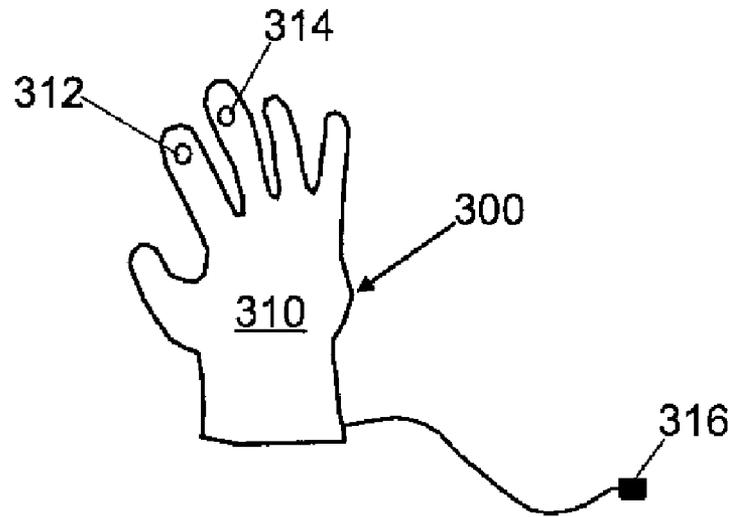


FIG. 3

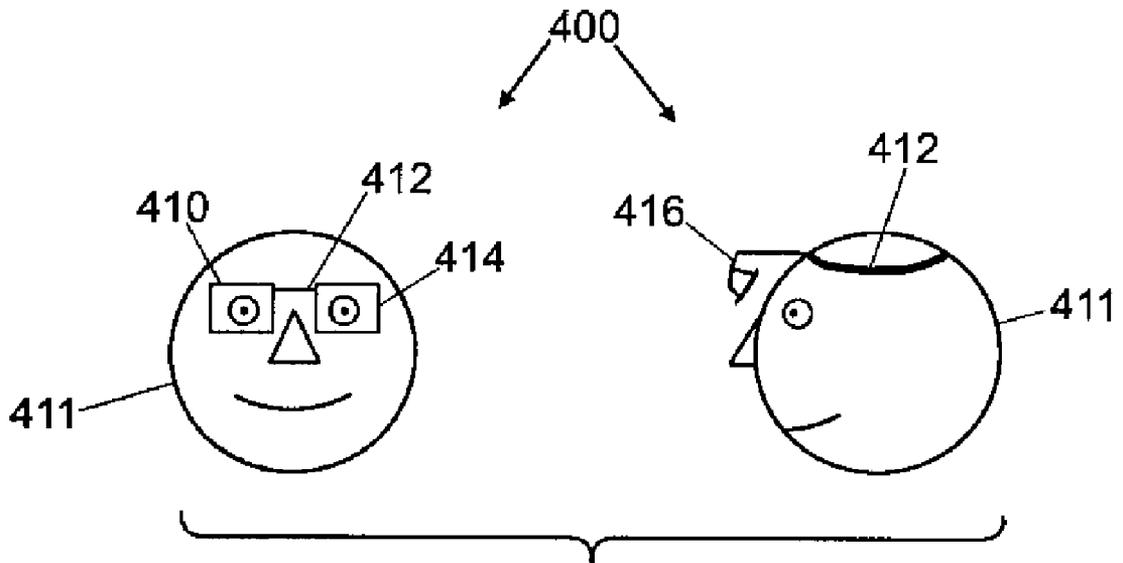


FIG. 4

1

SYSTEM AND METHOD FOR SELECTIVELY ENABLING A CONTROL SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a Continuation of U.S. patent application Ser. No. 11/566,603, filed Dec. 4, 2006, now abandoned, which claims the benefit of U.S. patent application Ser. No. 10/251,666, filed Sep. 19, 2002, now issued as U.S. Pat. No. 7,145,477 and U.S. Provisional Application Ser. No. 60/323,754, filed Sep. 19, 2001, and expressly incorporates by reference the above-mentioned applications.

BACKGROUND

The present disclosure relates to the field of anti-terrorist security systems for commercial aircraft. In particular, the present disclosure relates to an anti-terrorist aircraft pilot sensor system.

In current aircraft, pilots and/or flight crews are vulnerable to catastrophic events that may place the aircraft and all aboard the aircraft in jeopardy. Events, such as, physical mishaps and even terrorist attacks on the pilot and crew are possible. If the pilot, and crew capable of operating the aircraft become disabled, then the aircraft could be placed into peril. Also, if terrorists or hijackers disable the pilot, then they can take command of the aircraft and use it for their own sinister interests that may place others at risk of injury or even death. What is needed is a system that can prevent the risks of injury and even great tragedy due to the loss of a pilot or aircraft hijacking.

SUMMARY

The disclosed device is directed towards enabling a control system. The system comprising at least one operator control affecting at least one performance parameter of the system, at least one biometric sensor, at least one physiological sensor and a central processor unit operatively coupled to the at least one biometric sensor, the at least one physiological sensor, and the at least one operator control. The central processor unit configured to confirm the identity of an operator from data obtained from the biometric sensor and to assess the condition of at least one physiological parameter exhibited by the operator from data obtained from the physiological sensor. The central processor unit configured to cause the at least one operator control to affect the at least one performance parameter of the system in response thereto.

The system may further comprise at least one biometric sensor and the at least one physiological sensor disposed in an operator garment. The operator garment comprises at least one glove having at least one finger print sensor and at least one pulse monitor. The operator garment comprises a headset having at least one eye retina pattern scanner and at least one pulse monitor. A detachable electrical cable which operatively couples the operator garment and the central processor unit. The system may further include an input component for permitting initialization of the apparatus, wherein the input component is selected from the group consisting of a keypad, a video camera, a microphone, thermal imager, and a bar code reader.

In another variation, the invention is a method of altering at least one operator control comprising the steps of: activating an operator sensor device associated with the operator; sensing biometric parameters of the operator; sensing physiological parameters of the operator; comparing the sensed biomet-

2

ric and physiological parameters of the operator with one or more stored data; detecting a discontinuity between the sensed biometric and physiological parameters and the stored data; transmitting a signal to a central processor unit that the discontinuity exists; processing the signal in the central processor unit; altering at least one performance parameter of the at least one operator control in response to the discontinuity; and transmitting an emergency signal to a remotely located control center.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 is a schematic of an exemplary anti-terrorist aircraft pilot sensor system;

FIG. 2 is a flowchart of the operation of the exemplary anti-terrorist pilot sensor system;

FIG. 3 is a diagram of an exemplary anti-terrorist aircraft pilot sensor glove; and

FIG. 4 is a diagram of an exemplary anti-terrorist aircraft pilot sensor headgear.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Persons of ordinary skill in the art will realize that the following description of the present invention is illustrative only and not in any way limiting. Other embodiments of the invention will readily suggest themselves to such skilled persons having the benefit of this disclosure.

FIG. 1 illustrates a schematic of an exemplary anti-terrorist aircraft pilot sensor system, or simply, pilot sensor system **10**. The pilot sensor system **10** includes a pilot sensor **12**. The pilot sensor **12** is operatively coupled to an input component **14** that provides data input for activation and deactivation of the pilot sensor **12**. For example, the input component **14** can be a keypad with alpha-numeric keys that are configured to accept user inputs, such as, a code in order to activate or deactivate the pilot sensor **12**. The input component **14** can also be audio or video, bar code reader, microphone, camera, thermal imager, eye retinal scanner or any combination thereof, for inputting a code to activate the pilot sensor **12**. The pilot sensor **12** comprises a sensor or a plurality of sensors, **16** that sense various biometric and/or physiological information of at least one of a pilot and co-pilot of the aircraft. Fingerprints or eye retina patterns are non-limiting examples of biometric information sensed by the sensors **16**. The sensors **16** can also measure physiological parameters, such as heart rate, blood pressure, pulse, and the like. The sensors **16** can be specific to the parameters sensed, such as a biometric sensor **18** or a physiological sensor **20**. The biometric sensor **18** senses biometric parameters, such as, fingerprints, eye retina patterns, and the like. The physiological sensor **20** senses physiological parameters such as heart rate, blood pressure, pulse, or even adrenaline levels, and the like.

The pilot sensor **12** is operatively coupled to an aircraft central processor unit **22**. The aircraft central processor unit **22** includes a processor, micro-processor and any combination thereof such that information can be processed, and programs can be executed. The aircraft central processor **22** also includes communication busses, memories, memory busses and input/output (I/O) circuitry such that information can be processed and signals transmitted and received. A transceiver **24** is operatively coupled to the aircraft central processor **22**. Signals can be transmitted and received by wireless communication via the transceiver **24**. The aircraft central processor **22** receives inputs from the pilot sensor **12**

and operates certain functions based on the inputs from the pilot sensor 12. The aircraft central processor 22 is operatively coupled to the autopilot 26. The aircraft central processor 22 can perform the function of placing the aircraft on an autopilot control 26. Autopilot 26 is the automatic flight control of the aircraft along a flight path without pilot intervention. The aircraft central processor 22 can also perform the function of transmitting an emergency signal 28 to a ground control 30. The emergency signal 28 can include information vital to the safety of the aircraft, such as location, heading, altitude, aircraft system operating parameters, distress messages and the like. The aircraft central processor 22 can send the emergency signal 28 via the transceiver 24. The ground control 30 being operatively coupled to a transceiver 32 can also communicate with the aircraft central processor 22. In one embodiment, the ground control 30 can send and receive information to and from the aircraft central processor unit 22 in addition to the emergency signal 28. The aircraft operability conditions taken from instrumentation and controls, audio and video information within the cabin of the aircraft, and the like, can be provided to the ground control 30. The ground control 30 is also operatively coupled to an emergency override 34. The emergency override, or simply override, 34 can be activated to override certain functions of the aircraft, such as, the autopilot 26. An emergency override signal can be transmitted via wireless communications to the override 34 from the ground control 32 in order to deactivate the autopilot 26 and place the aircraft into manual flight control.

Referring to FIG. 2, a flowchart of the operation of the exemplary anti-terrorist pilot sensor system is illustrated. The operation of the exemplary anti-terrorist pilot sensor system requires that the system be installed into an aircraft. With the system components in place, the pilot and/or the co-pilot, or any other crewmember that will take command of the aircraft can activate the system. For simplicity, and by no means limiting the scope of the invention, the pilot will be the primary user of the system. The pilot sensor is activated as shown in block 100. The pilot sensor is activated when the pilot attaches the pilot sensor proximate to the pilots body, and the pilot then enters a code through the input component and the pilot sensor stores the code for future use during the flight or in other embodiments, other periods of time, such as a week, a month, and the like. The pilot sensor is activated with entry of the code. The pilot sensor senses the biometric and/or physiological parameters of the pilot, block 110, and compares the sensed data with a standard set of biometric and physiological parameters for the pilot stored in a memory as data. The biometric and physiological data of the user can also be stored in the aircraft central processor unit. The biometric parameters will be compared, block 120, to biometric parameters of the user, stored as data in a memory. If the biometric parameters are determined to be acceptable matches, then the pilot sensor remains activated. The acceptable matches indicate normal parameters, block 130, and a normal operating condition. Then the aircraft will remain in a normal flight control mode, block 140.

The pilot sensor can also monitor the physiological parameters of the user. Certain ranges of the physiological parameters will be stored in the memory. The physiological parameters can be associated with various external stimuli the pilot may experience. The pilot will have elevated heart rate due to being nervous or scared. The pilot may have very low or no blood pressure in a case of pilot injury or death. The pilot sensor can monitor the biometric and physiological parameters of the pilot through the biometric sensors and physiological sensors. If any of the parameters fail to match the recorded parameters of the pilot that is compared from the

memory then a discontinuity in the parameters exists, block 150. Upon sensing a discontinuity, the pilot sensor will send a signal to the aircraft central processor unit, block 160. The aircraft central processor unit will then perform a command and control process, block 170. If certain conditions are met, the aircraft central processor unit will send a signal to the autopilot device to activate the autopilot, block 180. The aircraft will then be flown on autopilot and manual control will be deactivated. The aircraft central processor will also send an emergency signal to ground control informing ground control of the conditions aboard the aircraft, block 190. If conditions aboard the aircraft are returned to a normal status, or the ground control determines a need, then override of the autopilot is available to the ground control. The ground control can send a command signal to the override that allows for manual control of the aircraft and deactivates the autopilot, block 200.

In an off normal condition, such as a terrorist attack on the pilot or even a health emergency of the pilot, the pilot will exhibit abnormal physiological parameters and/or the biometric sensor will sense that the biometric parameters are no longer acceptable matches and a discontinuity of the parameters exists (i.e. the pilot sensor has been detached from the pilot). The discontinuity of the biometric parameters and/or the physiological parameters sensed by the pilot sensor can trigger a signal to be sent to the aircraft central processor unit. The system can place the aircraft on autopilot to prevent manual control of the aircraft by unauthorized users, such as hijackers, and terrorists. By placing the aircraft into autopilot as well as sending out an emergency signal to ground control, the aircraft can remain on a safe flight path. The ground control can activate emergency procedures, monitor the aircraft flight systems and cabin and provide assistance. While the aircraft is on autopilot, any hijacker can be prevented from altering the course of the aircraft and placing the aircraft in harms way. A return to normal parameters can also be an event that allows for deactivation of the autopilot and a return to the manual flight control. For example, a disconnection of the pilot sensor from the communication path can trigger the autopilot and a reconnection of the pilot sensor can allow for return to manual control.

FIGS. 3 and 4 illustrate exemplary embodiments of pilot sensors 300 and 400. The embodiment of FIG. 3 is a pilot sensor 300 in the form of a glove 310. It is also contemplated that a pair of gloves (not shown) can be employed in an embodiment. The glove 310 includes a physiological sensor (vital function sensor) 312 and a biometric sensor (identification sensor) 314. The sensors can be placed at various locations on the glove 310 that are conducive to sensing the parameters. In one embodiment, the biometric sensor 312 can be located proximate to at least one fingertip to sense a fingerprint. The physiological sensor 314, in one embodiment, can be located proximate to the wrist to sense a pulse. It is contemplated that the location of the sensors will depend on the type of sensor employed. A cord 316 can be coupled to the glove 310 to operatively couple the glove 310 to the aircraft central processor unit (not shown). The cord 316 can be adapted for connection and disconnection to the input component (not shown) or other peripherals, such as a power source, battery charger, aircraft systems, and the like.

FIG. 4 illustrates another exemplary embodiment of the pilot sensor 400. The pilot sensor 400 is made up of a head set 410 worn on a pilot's head 411, including at least one physiological sensor 412 and at least one biometric sensor 414. The biometric sensor 414 and the physiological sensor 412 can read directly into the eye. The biometric sensor 414 can sense the eye retina pattern of the eye and the physiological sensor

5

412 can sense the pulse in the eye. In another embodiment, the physiological sensor 412 can be located along the head or even near the neck to sense various physiological parameters. Included with the headset 410 can be the input component 416 that can receive a visual or video input from the pilot or in the cockpit. Other video or audio equipment can be employed in parts of the aircraft to provide information to ground control.

While embodiments and applications of this invention have been shown and described, it would be apparent to those skilled in the art that many more modifications than mentioned above are possible without departing from the inventive concepts herein. The invention, therefore, is not to be restricted except in the spirit of the appended claims.

What is claimed is:

1. An apparatus comprising:
a system having at least one operator control affecting at least one performance parameter

of the system; at least one biometric sensor; at least one physiological sensor; a central processor unit operatively coupled to the at least one biometric sensor, the at least one physiological sensor, and the at least one operator control, the central processor unit configured to confirm the identity of an operator from the data obtained from the biometric sensor, compare sensed biometric and physiological parameters of the at least one operator with one or more stored data, detect a discontinuity between the sensed biometric and physiological parameters and the stored data, alter the at least one performance parameter of the at least one operator control in response to the discontinuity, detect an abnormality in a surrounding environment causing the discontinuity, provide at emergency signal for transmitting an emergency signal to a remotely located control center, and to assess the condition of at least one physiological parameter exhibited by the operator from data obtained from the physiological sensor, and to cause the at least one operator control to affect the at least one performance parameter of the system in response thereto.

2. The apparatus of claim 1 wherein the at least one biometric sensor and the at least one physiological sensor are disposed in an operator garment.

3. The apparatus of claim 2 wherein the operator garment comprises at least one glove having at least one finger print sensor and at least one pulse monitor.

4. The apparatus of claim 2 wherein the operator garment comprises a headset having at least one eye retina pattern scanner and at least one pulse monitor.

5. The apparatus of claim 2 further comprising a detachable electrical cable which operatively couples the operator garment and the central processor unit.

6. The control system of claim 1 further comprising an input component for permitting initialization of the apparatus, wherein the input component is selected from the group consisting of a keypad, a video camera, a microphone, thermal imager, and a bar code reader.

7. The control system of claim 1 wherein the central processor unit which is operatively coupled to the at least one biometric sensor, the at least one physiological sensor, and the at least one operator control through a transceiver.

8. A method of altering at least one operator control comprising:

activating an operator sensor device associated with the operator;

sensing biometric parameters of the operator;

6

sensing physiological parameters of the operator;
comparing the sensed biometric and physiological parameters of the operator with one or more stored data;
detecting a discontinuity between the sensed biometric and physiological parameters and the stored data;
transmitting a signal to a central processor unit that the discontinuity exists;
processing the signal in the central processor unit;
altering at least one performance parameter of the at least one operator control in response to the discontinuity;
detecting an abnormality in a surrounding environment causing the discontinuity; and
transmitting an emergency signal to a remotely located control center.

9. The method of altering at least one operator control of claim 8 wherein activating the operator sensor device includes inputting information into an input component.

10. The method of altering at least one operator control of claim 8 wherein sensing biometric parameters includes sensing a fingerprint.

11. The method of altering at least one operator control of claim 8 wherein sensing biometric parameters includes sensing an eye retina pattern.

12. The method of altering at least one operator control of claim 8 wherein sensing physiological parameters includes sensing a blood pressure.

13. The method of altering at least one operator control of claim 8 wherein sensing physiological parameters includes sensing a heart rate.

14. The method of altering at least one operator control of claim 8 further comprising; detecting one or more matches between the sensed biometric and physiological parameters and the stored data, wherein the stored data includes normal biometric and physiological data of the operator.

15. The method of altering at least one operator control of claim 8 wherein the discontinuity signal includes a disconnection of the operator sensor device from operative communication with the central processing unit.

16. The method of altering at least one operator control of claim 8 wherein transmitting the emergency signal to the control center includes transmitting at least one performance parameter of the system.

17. The method of altering at least one operator control of claim 8 wherein altering the at least one performance parameter includes preventing manual control of the same at least one performance parameter by the operator.

18. The method of altering at least one operator control of claim 8 further comprising altering the at least one performance parameter from the control center.

19. The method of altering at least one operator control of claim 18 wherein altering at least one performance parameter of the system from the control center includes sending and receiving information to the central processing unit.

20. The method of altering at least one operator control of claim 8 further comprising the step of coupling a central processor unit which is operatively coupled to at least one biometric sensor, at least one physiological sensor, and at least one operator control through a transceiver.

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