We claim:

1. A system for monitoring the wing anti-icing valve, comprising:

time record device configured to record time for opening or closing the anti-icing valve;

data acquisition device configured to obtain the time for opening or closing the anti-icing valve recorded by the time record device; and

message generation device configured to generate the anti-icing valve performance message according to the time for opening or closing the anti-icing valve obtained by the data acquisition device.

2. The system of Claim 1, wherein the time record device comprises a timer configured to record the duration from the time at which the WING switch is turned from the press-in position to the press-out position to the time at which the anti-icing valve is in the closing position.

3. The system of Claim 1, wherein the anti-icing valve comprises a sensor configured to detect whether the anti-icing valve is in the open state; wherein the time record device comprises a timer configured to record the duration from the time at which the WING switch is turned from the press-out position to the press-in position to the time at which the anti-icing valve is in the opening position.

4. The system of Claim 1, wherein the time record device records the timings of that the WING switch is turned from the press-in position to the press-out position and the anti-icing valve is in the closing position or the

timings of that the WING switch is turned from the press-out position to the press-in position and the anti-icing valve is in the opening position.

5. The system of Claim 1, further comprises anti-icing valve performance assessment device configured to receive the anti-icing performance message and assess the performance of the anti-icing valve according to the time for opening or closing the anti-icing valve in the anti-icing valve message.

6. The system of Claim 5, wherein the anti-icing valve performance assessment device refers to the history data of the time for opening or closing the anti-icing valve.

7. The system of Claim 6, wherein the anti-icing valve performance assessment device estimates the failure time of the anti-icing valve.

8. The system of Claim 1, further comprises communication device configured to transmit the anti-icing valve message to the anti-icing valve performance assessment device.

9. The system of Claim 5, wherein the anti-icing valve message comprises the revised time for opening or closing the anti-icing valve, the revision formula is as follows:

the revised time =the time before revised+(a*(PD)+b);

wherein PD refers to the bleed air pressure, a and b are revised parameters.

10. The system of Claim 9, wherein the anti-icing valve message comprises: the status before the WING switch being pressed-in, the status after the WING switch being pressed-in, the status when the WING switch is

pressed-out and the time for closing the anti-icing valve; or, comprises: the status before the WING switch being pressed-in, the status after the WING switch being pressed-in and the time for opening; wherein the status at least comprises the bleed air pressure of the engine.

11. The system of Claim 10, wherein the anti-icing valve performance assessment device determines whether the revised time for opening or closing the anti-icing valve is greater than the first threshold or the second threshold; wherein, the second threshold is greater than the first threshold.

12. The system of Claim 10, wherein the anti-icing valve performance assessment device determines whether the revised time for opening or closing the anti-icing valve is changed substantially compared with the history data.

13. The system of Claim 12, wherein the anti-icing valve performance assessment device determines whether the revised time for opening or closing the anti-icing valve is changed substantially compared with the history data by examining independent samples.

14. The system of Claim 12, wherein the anti-icing valve performance assessment device determines whether the revised time for opening or closing the anti-icing valve is changed substantially compared with the history data by the changing trend of the linear fitting slope.

15. A method for monitoring the wing anti-icing valve, comprising:

recording the time for opening or closing the anti-icing valve;

obtaining the time for opening or closing the anti-icing valve recorded by the time record device; and

generating the anti-icing valve message according to the time for opening or closing the anti-icing valve obtained by the data acquisition device.

16. The method of Claim 15, wherein recording the time for closing the anti-icing valve comprises recording the time from the time at which the WING switch is turned from the press-in position to the press-out position to the time at which the anti-icing valve is in the closing position.

17. The method of Claim 15, wherein recording the time for opening the anti-icing valve comprises recording the time from the time at which the WING switch is turned from the press-out position to the press-in position to the time at which the anti-icing valve is in the opening position.

18. The method of Claim 15, further comprises recording the timings of that the WING switch is turned from the press-in position to the press-out position and the anti-icing valve is in the closing position or the timings of that the WING switch is turned from the press-out position to the press-in position and the anti-icing valve is in the opening position.

19. The method of Claim 15, further comprises receiving the anti-icing valve performance message and assessing the performance of the anti-icing valve according to the time for opening or closing the anti-icing valve in the anti-icing valve performance message.

20. The method of Claim 19, further comprises referring to the history data of the time for opening or closing the anti-icing valve.

21. The method of Claim 20, further comprises estimating the failure time of the anti-icing valve.

22. The method of Claim 15, further comprises transmitting the anti-icing valve performance message via air-ground data link.

23. The method of Claim 19, further comprises revising the time for opening or closing the anti-icing valve, wherein the revision formula is as follows:

the revised time =the time before revised+(a*(PD)+b);

wherein PD refers to the bleed air pressure, a and b are revised parameters.

24. The method of Claim 23, wherein the anti-icing valve message comprises: the status before the WING switch being pressed-in, the status after the WING switch being pressed-in, the status when the WING switch is pressed-out and the time for closing the anti-icing valve; or, comprises: the status before the WING switch being pressed-in, the status after the WING switch being pressed-in and the time for opening; wherein the status at least comprises the bleed air pressure of the engine.

25. The method of Claim 23, wherein the step of assessing the performance of the anti-icing valve comprises determining whether the revised time for opening or closing the anti-icing valve is greater than the first threshold or the second threshold; wherein, the second threshold is greater than the first threshold.

26. The method of Claim 23, wherein the step of assessing the performance of the anti-icing valve comprises determining whether the revised time for opening or closing the anti-icing valve is changed substantially compared with the history data.

27. The method of Claim 26, wherein the step of determining whether the revised time for opening or closing the anti-icing valve is changed substantially compared with the history data comprises determining whether the revised time for opening or closing the anti-icing valve is changed substantially compared with the history data by examining independent samples.

28. The method of Claim 26, wherein the step of determining whether the revised time for opening or closing the anti-icing valve is changed substantially compared with the history data comprises determining whether the revised time for opening or closing the anti-icing valve is changed substantially compared with the history data by the changing trend of the linear fitting slope.

29. The method of Claim 24, wherein the anti-icing valve performance message comprises the time for closing the anti-icing valve, wherein the step of generating the anti-icing valve performance message comprises:

determining whether the wing anti-icing system has already worked properly;

collecting the state before the WING switch being pressed-in and the state after the WING switch being pressed-in;

collecting the state when the WING switch is pressed-out in response to that the WING switch is turned from the press-in position to the press-out position;

obtaining the time for closing the anti-icing valve; and

generating the anti-icing valve performance message.

30. The method of Claim 24, wherein the step of determining whether the wing anti-icing system has already worked properly comprises: determining: (1) whether the WING switch is held at the ON position; (2) whether the pressure of the bleed air pipe is greater about 15 psi; (3) whether the position of the anti-icing valve is shown being at the "non-closing" position; and (4) whether the lasting time is greater than about 5 seconds.

31. The method of Claim 24, further comprises: determining the failure in the valve in response to that the time for closing the anti-icing valve is greater than about 30 seconds.

32. A method for maintaining the wing anti-icing valve, comprising:

obtaining one or more anti-icing valve performance messages, wherein, the anti-icing valve performance message comprises at least the time for opening or closing the anti-icing valve;

assessing the performance of the wing anti-icing valve;

arranging the maintenance plan of the anti-icing valve; and

maintaining the wing anti-icing valve.

We claim:

1. A system for monitoring a wing anti-icing valve having an open position and a closed position, the system comprising:

a time recording device configured to record at least one of (A) a time between a first event of turning a WING switch from a press-out position to a press-in position and a second event of the wing anti-icing valve moving to the open position, and (B) a time between a third event of turning a WING switch from a press-in position to a press-out position and a fourth event of the wing anti-icing valve moving to the closed position;

a data acquisition device configured to obtain the at least one of the time between the first and second events and the time between the third and fourth events recorded by the time recording device; and

a message generation device configured to generate a wing anti-icing valve performance message according to the at least one of the time between the first and second events and the time between the third and fourth events obtained by the data acquisition device.

2. The system of claim 1, wherein the time recording device comprises a timer configured to record the time between the third event and the fourth event .

3. The system of claim 1, wherein the wing anti-icing valve comprises a sensor configured to detect whether the anti-icing valve is in the open position; wherein the time recording device comprises a timer configured to record the time between the first event and the second event.

4. The system of claim 1, further comprising a wing anti-icing valve performance assessment device configured to receive the wing anti-icing valve performance message and assess the performance of the wing anti-icing valve according to the at least one of the time between the first and second events and the time between the third and fourth events in the wing anti-icing valve performance message.

5. The system of claim 4, wherein the wing anti-icing valve performance assessment device refers to history data of the at least one of the time between the first event and second event and the time between the third event and the fourth event.

6. The system of claim 5, wherein the wing anti-icing valve performance assessment device estimates a failure time of the wing anti-icing valve.

7. The system of claim 4, further comprising a communication device configured to transmit the wing anti-icing valve performance message to the wing anti-icing valve performance assessment device.

8. The system of claim 4, where in the wing anti-icing valve performance message comprises a revised time for at least one of (A) the time between the first event and the second event, and (B) the time between the third event and the fourth event, wherein the revised time is calculated using a revision formula as follows:

the revised time =the time before revised+(a*(PD)+b);

wherein PD refers to the bleed air pressure, a and b are revised parameters.

9. The system of claim 8, wherein the wing anti-icing valve performance message comprises: a status before the first event, a status after the first event , a status during the second event ; or, comprises: a status before the third event, a status during the fourth event ; wherein the statuses each comprise at least a bleed air pressure of an engine.

10. The system of claim 9, wherein the wing anti-icing valve performance assessment device determines whether the revised time for the at least one of (A) the time between the first event and the second event, and (B) the time between the third event and the fourth event is greater than a first threshold or a second threshold; wherein, the second threshold is greater than the first threshold.

11. The system of claim 9, wherein the wing anti-icing valve performance assessment device determines whether the revised time for the at least one of (A) the time between the first event and the second event, and (B) the time between the third event and the fourth event is changed substantially compared with the history data.

12. The system of claim 11, wherein the wing anti-icing valve performance assessment device determines whether the revised time for the wing anti-icing valve to move to the open position or closed position is changed substantially compared with the history data by examining independent samples.

13. The system of claim 11, wherein the wing anti-icing valve performance assessment device determines whether the revised time for the at least one of (A) the time between the first event and the second event, and (B) the time between the third event and the fourth event is changed substantially compared with the history data by a changing trend of a linear fitting slope.

14. A method for monitoring a wing anti-icing valve having an open position and a closed position, comprising:

recording a time for the wing anti-icing valve to move to the open position or closed position;

obtaining the time for the wing anti-icing valve to move to the open position or closed position recorded by the time record device;

generating a wing anti-icing valve performance message according to the time for the anti-icing valve to move to the open position or closed position obtained by the data acquisition device; and

receiving the wing anti-icing valve performance message;

referring to history data of the time for the wing anti-icing valve to move to the open position or closed position; and

assessing the performance of the wing anti-icing valve according to the time for the wing anti-icing valve to move to the open position or the closed position in the wing anti-icing valve performance message.

15. The method of claim 14, wherein the step of recording the time for the wing anti-icing valve to move to the closed position comprises recording a time from when a WING switch is turned from a press-in position to a press-out position to the time for the wing anti-icing valve to move to the closed position.

16. The method of claim 14, wherein the step of recording the time for the wing anti-icing valve to move to the open position comprises recording a time from when a WING switch is turned from a press-out position to a press-in position to the time for the wing anti-icing valve to move to the open position.

17. The method of claim 14, further comprising recording a time between when a WING switch is turned from a press-in position to a press-out position and when the wing anti-icing valve is moved to the closed position or a time between when a WING switch is turned from a press-out position to a press-in position and when the wing anti-icing valve is moved to the opening open position.

18. The method of claim 14, further comprising estimating a failure time of the wing anti-icing valve.

19. The method of claim 14, further comprising transmitting the wing anti-icing valve performance message via an air-ground data link.

20. The method of claim 14, further comprising revising the time for the wing anti-icing valve to move to the open position or closed position using a revisions formula, wherein the revision formula is as follows:

the revised time =the time before revised+(a*(PD)+b);

wherein PD refers to the bleed air pressure, a and b are revised parameters.

21. The method of claim 20, wherein the wing anti-icing valve performance message comprises: a status before a WING switch is pressed-in, a status after the WING switch pressed-in, a status when the WING switch is pressed-out and the time for the wing anti-icing valve to move to the closed position; or, comprises: a status before a WING switch is pressed-in, status after the WING switch is pressed-in and the time for the wing anti-icing valve to move to the open position; wherein each of the statuses comprises at least a bleed air pressure of an engine.

22. The method of claim 20, wherein the step of assessing the performance of the wing anti-icing valve comprises determining whether the revised time for the wing anti-icing valve to move to the open position or closed position is greater than a first threshold or a second threshold; wherein, the second threshold is greater than the first threshold.

23. The method of claim 20, wherein the step of assessing the performance of the wing anti-icing valve comprises determining whether the revised time for the wing anti-icing valve to move to the open position or closed position is changed substantially compared with history data.

24. The method of claim 23, wherein the step of determining whether the revised time for the anti-icing valve to move to the open position or closed position is changed substantially compared with the history data comprises determining whether the revised time for the wing anti-icing valve to move to the open position or closed position is changed substantially compared with the history data by examining independent samples.

25. The method of claim 23, wherein the step of determining whether the revised time for the wing anti-icing valve to move to the open position or closed position is changed substantially compared with the history data comprises determining whether the revised time for opening or closing the wing anti-icing valve to move to the open position or closed position is changed substantially compared with the history data by a changing trend of a linear fitting slope.

26. The method of claim 21, wherein the wing anti-icing valve performance message comprises the time for the anti-icing valve to move to the closed position, wherein the step of generating the wing anti-icing valve performance message comprises:

determining whether the wing anti-icing valve has already worked properly;

collecting the status before the WING switch is pressed-in and the status after the WING switch is pressed-in;

collecting the status when the WING switch is pressed-out;

obtaining the time for the wing anti-icing valve to move to the closed position; and

generating the wing anti-icing valve performance message.

27. The method of claim 26, wherein the step of determining whether the wing anti-icing valve has already worked properly comprises: determining: (1) whether the WING switch is held at an ON position; (2) whether the pressure of the bleed air pipe is greater than 15 psi; (3) whether the position of the wing anti-icing valve is shown being at a "non-closed" position; and (4) whether a lasting time is greater than about 5 seconds.

28. The method of claim 21, further comprising: determining a failure in the wing anti-icing valve if the time for the wing anti-icing value to move to the closed position is greater than 30 seconds.

29. A method for maintaining a wing anti-icing valve, comprising:

obtaining one or more wing anti-icing valve performance messages, wherein, the one or more wing anti-icing valve performance messages comprises at least one of (A) a time between a first event of turning a WING switch from a press-out position to a press-in position and a second event of the wing anti-icing valve moving to the open position, and (B) a time between a third event of turning a WING switch from a press-in position to a press-out position and a fourth event of the wing anti-icing valve moving to the closed position;

assessing the performance of the wing anti-icing valve;

arranging a maintenance plan for the wing anti-icing valve; and

maintaining the wing anti-icing valve.