We claim:

1. A method for monitoring performance of an Auxiliary Power Unit (APU) turbine efficiency of an aircraft, comprising:

obtaining APU messages of multiple time points within a period;

obtaining APU startup parameters including at least a rotation speed at a peak of gas temperature (EGT) according to the APU messages;

calculating a percentage (NPA) of the rotation speed when the exhausting gas temperature EGT reaches its peak in the APU startup stage relative to the rotation speed in the APU normal operation;

calculating an average of NPAs of the multiple time points within the period; and

determining the APU turbine efficiency is in one of the stable, decline and failure phases according to the average of the NPAs.

2. The method of claim 1, wherein the determining of the APU turbine efficiency is in one of the stable, decline and failure phases comprises:

determining the APU turbine efficiency is in the decline phase in response to the average of the NPAs of the multiple time points within the period close to a first threshold; and

determining the APU turbine efficiency is in the failure phase in response to the average of the NPAs of the multiple time points within the period close to a second threshold.

3. The method of claim 2, wherein the APU is an APS3200 type of APU, the first and second thresholds are about 35% and 32%, respectively, and the wording "close to" means the relative difference is not larger than about 1.5%.

4. The method of claim 2, wherein the APU is a GTCP131-9A type of APU, the first and second thresholds are about 45% and 40%, respectively, and "close to" includes the relative difference not being larger than about 2.5%.

5. The method of claim 1, wherein 10-20 APU messages are obtained within the period.

6. The method of claim 1, further comprising: fitting all of the NPAs of the multiple time points within the period, linearly or nonlinearly, and linearly extrapolating the result of the fitting; determining that the APU turbine efficiency enters the decline phase if an intersection of the result of the linear extrapolation and a first threshold is within about one month; and determining that the APU turbine efficiency enters the failure phase if the intersection of the result of the linear extrapolation and a second threshold is within about one month; wherein the first and second thresholds are empirical values, and the first threshold is less than the second threshold.

7. The method of claim 6, further comprising:

calculating a confidence interval of NPAs in the result of the fitting after the linear or nonlinear fitting.

8. The method of claim 7, further comprising:

estimating a time range in which the APU turbine efficiency enters the decline or failure phase, according to the intersections of the result of the extrapolation of the confidence interval and the first and second thresholds.

9. The method of claim 1, further comprising:

determining whether the corrected exhausting gas temperature peak EGTP at the APU's startup is close to a red line value, wherein the EGTP is corrected by using the following formula:

EGTP_COR=((EGTP+273.5)/THITA)−273.5

where EGTP_COR is the corrected EGTP, EGTP is itself before correction, and THITA=e^(−((AltValue*CoverFt)/1000)/((8.51*(273.15+TATValue))/(9.8*29))), and

wherein AltValue is the altitude (m), CoverFt is the conversion constant between the foot and meter, and TATValue is the temperature (Celsius scale).

10. The method of claim 1, wherein:

a startup time (STA) remains normal.

11. A device for monitoring performance of an Auxiliary power Unit (APU) turbine efficiency of an aircraft, comprising a processor and a storage configured to store a computer readable code configured to instruct the processor the following: a message obtaining unit configured to obtain APU messages of multiple time points within a period; a message parsing unit configured to parse out APU startup parameters including at least a rotation speed at a peak of gas temperature (EGT) according to the APU messages; a performance monitoring unit configured to determine the performance of the APU turbine efficiency is in a stable, decline or failure phase by: calculating a percentage (NPA) of the rotation speed when the exhausting gas temperature EGT reaches its peak in the APU startup stage relative to the rotation speed in the APU normal operation, calculating an average of NPAs of the multiple time points within the period; and determining the APU turbine efficiency is in one of the stable, decline and failure phases according to the average of the NPAs.

12. A device for monitoring performance of an Auxiliary Power Unit (APU) turbine efficiency of an aircraft, comprising: a processor; and a storage connected with the processor configured to store a computer-readable code, wherein the computer-readable code is run on the processor to implement the steps of: obtaining APU messages of multiple time points within a period; parsing out APU startup parameters including at least a rotation speed at a peak of gas temperature (EGT) based on the APU messages; and determining the performance of the APU turbine efficiency is in a stable, decline or failure phase, the determining comprises; calculating a percentage (NPA) of the rotation speed when the exhausting gas temperature EGT reaches its peak in the APU startup stage relative to the rotation speed in the APU normal operation, calculating an average of NPAs of the multiple time points within the period, and determining the APU turbine efficiency is in the stable, decline and failure phases according to the average of the NPAs.