CLAIMS

1. A method for predicting an operational anomaly of equipment of an aircraft of a fleet of a same type of aircraft, each item of said equipment of each aircraft having at least one operating or state parameter, said parameter being tracked in the course of flights, over time, by measurements of equipment parameters recorded in a memory of the aircraft, said recorded measurements that are signals, pinpointable in time, for the corresponding parameter, the corresponding item of equipment, and the corresponding aircraft, the aircraft further including a fault detector configured to detect faults of the equipment, said faults being recorded in a memory of the aircraft, said recorded faults being pinpointable in time and for at least the corresponding item of equipment and the corresponding aircraft, the recorded measurements and the recorded faults being pinpointable for each corresponding flight, the method comprising:

during inter-flight maintenance phases, copying the recorded measurements and one or more possible faults into a programmable processor to form a database of aircraft measurements of the fleet, during at least one of the inter-flight maintenance phases, executing a data analysis program in the processor, at least a first time, on the database;

determining, with the data analysis program, a set of pairs of parameters for which the signals of the pair of the parameters evolve in a positively-correlated manner over time and in the absence of any recorded fault for at least one given flight of at least one of the aircraft of the fleet, the correlation corresponding to a calculation result greater than a positive determined correlation threshold for a value of correlation between signals of the pair of the parameter;

during at least one of the inter-flight maintenance phases, after the set of pairs of parameters is determined, executing at least one program from among a first detection program and a second detection program in the processor on the database of aircraft measurements, the executing occurring during the inter-flight maintenance phase when determining of pairs of parameters is performed or during another inter-flight maintenance phase subsequent to the maintenance phase in when the determining the pairs of parameters is performed; and

calculating, when first detection program is executed, the correlations for the pairs of the determined set of pairs for one or more flights subsequent to one or more flights that served for said determination of pairs, and when the value of the calculated correlation of a pair of the determined set of pairs falls below a positive determined detection threshold, then indicating, on a display, a first type of anomaly for the item or items of equipment corresponding to the signals of the pair for said flight in its entirety, or

calculating, when the second detection program is executed, the correlations for the pairs of the determined set of pairs for one or more flights

subsequent to one or more flights that served for said determination of pairs over determined time periods of each flight, each time period defining a block of data in the signals of the database of the processor, and when the value of the calculated correlation of a pair of the determined pairs for the considered period falls below or becomes equal to a positive determined detection threshold, then indicating, on a display, a first type of anomaly for the item or items of equipment corresponding to the signals of the pair for said considered period of said flight.

2. The method as claimed in claim 1, wherein at least the second detection program is executed in the processor.

3. The method as claimed in claim 2, wherein the time periods have identical durations, a given flight being sliced into equal time periods.

4. The method as claimed in claim 3, wherein the variation of the correlation between two successive periods of each flight for which the correlations per periods for the pairs of the determined set of pairs have been calculated is furthermore calculated for each period, and when the value of the calculated variation of a pair between the two successive considered periods exceeds a determined threshold of variation and, preferably signaling a decrease in the correlation of the pair from one period to the next, a second type of anomaly is indicated, on the display, for the item or items of equipment corresponding to the signals of the pair for said two considered periods of said flight.

5. The method as claimed in claim 2, wherein the time periods have durations that are variable and that correspond to a determined flight phase, the flight phases being taxiing, takeoff, cruising flight, and landing.

6. The method as claimed in claim 5, wherein the variation of the correlation between two successive periods of each flight for which the correlations per periods for the pairs of the determined set of pairs have been calculated is furthermore calculated for each period, and when the value of the calculated variation of a pair between the two successive considered periods exceeds a determined threshold of variation and, preferably signaling a decrease in the correlation of the pair from one period to the next, a second type of anomaly is indicated, on the display, for the item or items of equipment corresponding to the signals of the pair for said two considered periods of said flight.

7. The method as claimed in claim 2, wherein the variation of the correlation between two successive periods of each flight for which the

correlations per periods for the pairs of the determined set of pairs have been calculated is furthermore calculated for each period, and when the value of the calculated variation of a pair between the two successive considered periods exceeds a determined threshold of variation and, preferably signaling a decrease in the correlation of the pair from one period to the next, a second type of anomaly is indicated, on the display, for the item or items of equipment corresponding to the signals of the pair for said two considered periods of said flight.

8. The method as claimed in claim 2, wherein the correlations are Pearson or Spearman correlations.

9. The method as claimed in claim 2, wherein for the execution of the data analysis program, using a correlation threshold equal to 0.7, the pairs of parameters having a calculation result of greater than 0.7 for the value of correlation between signals.

10. The method as claimed in claim 2, wherein the sets of pairs are determined and the detection program executed individually for each given aircraft of the fleet, the signals of the various aircraft of the fleet not being used together in common for the data analysis program and the detection program.

11. The method as claimed in claim 2, wherein the results of correlation calculations of the one or more detection programs are represented graphically, and to represent the correlation information per flight or per period, the difference with 1 of the correlation calculation result is used so that a correlation which remains strong is represented close to zero and the correlation calculation result is bounded between [0-1] so that correlations that have become negative are displayed at 1.

12. The method as claimed in claim 2, wherein the calculations of the detection programs are limited to a subset of the set of determined pairs, said subset corresponding to a statistical selection of the pairs of the set, the selection corresponding to one or more of the following criteria:

- a maximum number of pairs,
- the pairs having the least variation between flights in the case where several flights are used for determining the set of pairs,
- the pairs having the least variation between aircraft in the case where several aircraft are used for determining the set of pairs.

13. The method as claimed in claim 1, wherein the correlations are Pearson or Spearman correlations.

14. The method as claimed in claim 1, wherein for the execution of the data analysis program, using a correlation threshold equal to 0.7, the pairs of parameters having a calculation result of greater than 0.7 for the value of correlation between signals.

15. The method as claimed in claim 1, wherein the sets of pairs are determined and the detection program executed individually for each given aircraft of the fleet, the signals of the various aircraft of the fleet not being used together in common for the data analysis program and the detection program.

16. The method as claimed in claim 1, wherein the results of correlation calculations of the one or more detection programs are represented graphically, and to represent the correlation information per flight or per period, the difference with 1 of the correlation calculation result is used so that a correlation which remains strong is represented close to zero and the correlation calculation result is bounded between [0-1] so that correlations that have become negative are displayed at 1.

17. The method as claimed in claim 1, wherein the calculations of the detection programs are limited to a subset of the set of determined pairs, said subset corresponding to a statistical selection of the pairs of the set, the selection corresponding to one or more of the following criteria:

- a maximum number of pairs,
- the pairs having the least variation between flights in the case where several flights are used for determining the set of pairs,
- the pairs having the least variation between aircraft in the case where several aircraft are used for determining the set of pairs.