

Claims

1. A method for automated generation of an optimised maintenance plan for a fleet of aircraft engines, the method comprising at least the following steps:
 - a) Acquiring input data (110) relating to a plurality of engines (E1, E2, E3, E4);
 - b) Providing an existing initial maintenance plan (140) or generating an initial maintenance plan (140) based on the acquired input data (110);
 - c) Determining a total maintenance effort for the fleet in case of an application of the initial maintenance plan;
 - d) Sorting the engines into a defined order according to at least one criterion;
 - e) Applying at least one optimisation strategy or heuristic (H1, H2, H3, H4) to the engines (E1, E2, E3, E4) in the defined order; and
 - f) Outputting an optimised maintenance plan for the engines (E1, E2, E3, E4) after application of step e) and/or output data (130).
2. The method according to claim 1, wherein in step e), each time an optimisation strategy (H1, H2, H3, H4) is applied to an individual maintenance plan of an engine (E1, E2, E3, E4), the influences on the other maintenance plans are determined and the changes made by the optimisation strategy are adopted only if this reduces the total maintenance effort for the engine fleet.
3. The method according to claim 1 or 2, wherein in step f), in addition to the optimised maintenance plan, output data are also output and the steps e) and f) are iterated until a predetermined termination criterion is fulfilled on the basis of the output data.
4. The method according to any one of claims 3, before each iteration of the steps e) and f) the engines (E1, E2, E3, E4) are re-sorted again according to step d) according to the at least one criterion.
5. The method according to claim 3 or 4, wherein a different optimisation strategy or heuristic (H1, H2, H3, H4) is applied at each iteration.

6. A method for automated generation of an optimised maintenance plan for a fleet of aircraft engines, the method comprising at least the following steps:
 - a) Acquiring input data (110) relating to a plurality of engines E1, E2, E3, E4,;
 - b) Providing an existing initial maintenance plan (140) or generating an initial maintenance plan (140) based on the acquired input data (110) for the engines (E1, E2, E3, E4);
 - c) Determining a total maintenance effort for the fleet in case of an application of the initial maintenance plan;
 - d') Optimising the initial maintenance plan (140) by means of a self-learning algorithm trained for this purpose; and
 - f') Outputting an optimised maintenance plan for the engines (E1, E2, E3, E4) after application of step d') and/or output data (130).

7. The method according to claim 6, wherein the initial maintenance plan (110) has been generated according to a method according to any one of claims 1 to 5.

8. The method according to any one of the preceding claims, wherein the input data (110) represents at least one data set selected from the group:
 - Mean Time Between Shop Visits (MTBSV);
 - the time effort and/or the costs (Workscope) of respective types of shop visits;
 - data regarding Life limited Parts (LLP) of the engines (E1, E2, E3, E4);
 - engine type;
 - availability of used and/or new spare parts;
 - costs of used and/or new spare parts;
 - technical specifications of the aircraft engines;
 - the time interval for each aircraft engine since the initial registration or since the last shop visit;
 - the availability of the same type of the respective aircraft engines planned for maintenance.

9. The method according to any one of the preceding claims, wherein the output data (130) output in step f) or f'), respectively, comprise one or more data sets selected from the group:
 - next maintenance date of the aircraft engines;

spare and short-term lease engines requirements for the next maintenance;
material requirements for the next maintenance;
working time requirements for the total maintenance plan;
total cost of ownership for the engine fleet;
costs per flight hour for the engine fleet;
cash flow.

10. The method according to any one of the preceding claims, wherein the total maintenance effort represents the labour effort or the material effort or total cost of the fleet.

11. A method for optimised maintenance of an engine fleet, wherein an optimised maintenance plan is first generated or obtained in accordance with any one of claims 1 to 10, and subsequently the engine fleet is maintained, repaired and/or overhauled in accordance with the maintenance plan.

12. A computer program configured to perform the method according to any one of claims 1 to 9.

13. A device for automated generation and optimisation of a maintenance plan for aircraft engines, wherein the device is configured to perform the method according to any one of claims 1 to 9.