SUMMARY

The subject matter of the present disclosure has been developed in response to the present state of the art, and in particular, in response to the limitations of conventional aircraft maintenance systems. Specifically, although some conventional aircraft maintenance systems may facilitate the monitoring of aircraft faults, delivery of information regarding limitations for deferring maintenance, and the entry of information regarding a deferred maintenance event, such systems do not assess the operational impacts associated with the deferral of maintenance. In other words, there are no conventional aircraft maintenance systems that obtain information regarding deferred maintenance events, determine operational limitations associated with deferred maintenance events, and determine operational impacts associated with the deferred maintenance events based on the operational limitations. Accordingly, the subject matter of the present disclosure has been developed to provide an apparatus, system, and method for assessing operational impacts associated with the deferral of aircraft maintenance that overcome at least some of the above-discussed shortcomings of the prior art.

According to one embodiment, an apparatus includes a minimum equipment list (MEL) data module and an impact assessment module. The MEL data module determines at least one operational limitation associated with deferred maintenance on a vehicle. The impact assessment module determines an operational impact associated with the deferred maintenance based on the at least one operational limitation. The impact assessment module assigns one of a plurality of operational impact values to the operational limitation, and the operational impact is determined based on an assigned operational impact value. At least one of the MEL data module and the impact assessment module comprises one or more of hardware and executable code, where the executable code is stored on one or more computer readable storage media.

In some implementations of the apparatus, the MEL data module categorizes the at least one operational limitation into one of a plurality of operational impact categories. The operational impact can be associated with the one of the plurality of operational impact categories. The plurality of operational impact categories may include at least two operational impact categories selected from the group consisting of maintenance impact, crew impact, passenger impact, and economic impact. The MEL data module can determine a plurality of operational limitations. Furthermore, the MEL data module may categorize at least one of the

plurality of operational limitations in a first of the plurality of operational impact categories and at least one of the plurality of operational limitations in a second of the plurality of operational impact categories. The operational impact can include a first operational impact associated with the first operational impact category and a second operational impact associated with the second operational impact category.

The MEL data module can determine a plurality of operational limitations. The impact assessment module assigns one of a plurality of operational impact values to each of the plurality of operational limitations. The operational impact can be based on an aggregation of the operational impact values assigned to each of the plurality of operational limitations. The operational impact may be one of a plurality of operational impacts, where each of the plurality of operational impacts is associated with a different aggregated operational impact value threshold.

In certain implementations, the apparatus includes a maintenance query module accesses at least one deferred maintenance record associated with the deferred maintenance from a maintenance information system and determines an MEL item from the at least one deferred maintenance record. The MEL data module locates the MEL item in an MEL document and determines the at least one operational limitation from the MEL item.

According to some implementations of the apparatus, the maintenance query module accesses a plurality of deferred maintenance records from the maintenance information system and determines an MEL item from each of the plurality of deferred maintenance records. The MEL data module can determine at least one operational limitation associated with each of the MEL items. Also, the operational impact can be associated with the plurality of deferred maintenance records based on the at least one operational limitation associated with each of the MEL items.

According to certain implementations of the apparatus, the operational impact corresponds with an impact of operating the vehicle.

In some implementations of the apparatus, the vehicle includes one of a plurality of vehicles of a vehicle fleet. The maintenance query module can access at least one deferred maintenance record for each of the plurality of vehicles from a maintenance information system and determine an MEL item from each of the deferred maintenance records. The MEL data module may locate the MEL items in respective MEL documents each associated with one of the plurality of vehicles and determine at least one operational limitation associated with each MEL item. Furthermore, the impact assessment module can determine an operational impact associated with the at least one deferred maintenance record for each of the plurality of vehicles. The impact assessment module can be further configured to determine a fleet operational impact associated with the deferred maintenance records of the plurality of vehicles based on an aggregation of the operational impacts of the plurality of vehicles.

According to certain implementations of the apparatus, the MEL data module searches the MEL item in the MEL document for key terms. The operational limitation can be determined based on results of the search for the key terms.

According to another embodiment, a system includes a maintenance information system that stores a deferred maintenance record, which includes an MEL item identifier associated with a deferral of maintenance of a system fault on a vehicle. Additionally, the system includes a deferred maintenance apparatus that determines the MEL item identifier, locates an MEL item associated with the MEL item identifier in an MEL document, determines at least one operational limitation associated with the MEL item, and determines an operational impact associated with the deferral of maintenance of the system fault based on the at least one operational limitation. The deferred maintenance apparatus assigns one of a plurality of operational impact values to the operational limitation, and the operational impact is determined based on an assigned operational impact value.

In some implementations of the system, the deferred maintenance apparatus automatically queries the maintenance information system to determine the MEL item identifier. The system may also include a data network. The aircraft, maintenance information system, and deferred maintenance apparatus can communicate with each other over the data network.

According to certain implementations, the maintenance information system can store a plurality of deferred maintenance records each associated with a deferral of maintenance of the

system fault associated with a respective vehicle of a plurality of vehicles of a vehicle fleet. Additionally, the deferred maintenance apparatus can determine the MEL item identifier for each of the plurality of deferred maintenance records, locate the MEL items associated with the MEL item identifiers in respective MEL documents, determine at least one operational limitation associated with each MEL item, and determine an operational impact associated with the deferral of maintenance of the system fault for each of the plurality of vehicles of the vehicle fleet based on the at least one operational limitation associated with the respective MEL item. In one implementation, the deferred maintenance apparatus determines a fleet operational impact based on an aggregation of the operational impacts associated with the deferral of maintenance of the system faults for all vehicles of the vehicle fleet.

According to another embodiment, a method includes determining, using a minimum equipment list (MEL) data module, at least one operational limitation associated with deferred maintenance on a vehicle. The method also includes determining, using an impact assessment module, an operational impact associated with the deferred maintenance based on the at least one operational limitation and assigning, using the impact assessment module, one of a plurality of operational impact values to the operational limitation. The operational impact is determined based on an assigned operational impact value. At least one of the MEL data module and impact assessment module includes one or more of hardware and executable code, the executable code stored on one or more computer readable storage media.

In yet another embodiment, a method includes obtaining at least one operational limitation associated with deferred maintenance of a vehicle. Additionally, the method includes determining an operational impact associated with the at least one deferred maintenance record based on the at least one operational limitation.

According to some implementations, the method may also include determining an MEL item identifier from a deferred maintenance record, where the at least one operational limitation is obtained from an MEL document based on the MEL item identifier. According to one implementation, the method also includes querying a vehicle maintenance information system to access the deferred maintenance record.

In some implementations, the method further includes categorizing the at least one operational limitation into one of a plurality of operational impact categories, comparing the at least one operational limitation to at least one predetermined impact factor associated with the one of the plurality of operational impact categories, and assigning an impact value to the at least one predetermined impact factor based on the comparison of the at least one operational limitation to the at least one predetermined impact factor. The operational impact can be determined based on the impact value. Also, the operational impact can identify an operational impact associated with the one of the plurality of operational impact categories.

CLAIMS

1. An apparatus, comprising:

a minimum equipment list (MEL) data module that determines at least one operational limitation associated with deferred maintenance on a vehicle; and

an impact assessment module that determines an operational impact associated with the deferred maintenance based on the at least one operational limitation, wherein the impact assessment module assigns one of a plurality of operational impact values to the operational limitation, and wherein the operational impact is determined based on an assigned operational impact value;

wherein at least one of the MEL data module and impact assessment module comprises one or more of hardware and executable code, the executable code stored on one or more computer readable storage media.

2. The apparatus of claim 1, wherein the MEL data module categorizes the at least one operational limitation into one of a plurality of operational impact categories, and wherein the operational impact is associated with the one of the plurality of operational impact categories.

3. The apparatus of claim 2, wherein the plurality of operational impact categories comprises at least two operational impact categories selected from the group consisting of maintenance impact, crew impact, passenger impact, and economic impact.

4. The apparatus of claim 2, wherein:

the MEL data module determines a plurality of operational limitations;

the MEL data module categorizes at least one of the plurality of operational limitations in a first operational impact category of the plurality of operational impact categories and at least one of the plurality of operational limitations in a second operational impact category of the plurality of operational impact categories; and

the operational impact comprises a first operational impact associated with the first operational impact category and a second operational impact associated with the second operational impact category.

5. The apparatus of claim 1, wherein the MEL data module determines a plurality of operational limitations, and wherein the impact assessment module assigns one of a plurality

of operational impact values to each of the plurality of operational limitations, the operational impact being based on an aggregation of the operational impact values assigned to each of the plurality of operational limitations.

6. The apparatus of claim 5, wherein the operational impact is one of a plurality of operational impacts, each of the plurality of operational impacts being associated with a different aggregated operational impact value threshold.

7. The apparatus of claim 1, further comprising a maintenance query module that accesses at least one deferred maintenance record associated with the deferred maintenance from a maintenance information system and determines an MEL item from the at least one deferred maintenance record, wherein the MEL data module locates the MEL item in an MEL document and determines the at least one operational limitation from the MEL item.

8. The apparatus of claim 7, wherein:

the maintenance query module accesses a plurality of deferred maintenance records from the maintenance information system and determines an MEL item from each of the plurality of deferred maintenance records;

the MEL data module determines at least one operational limitation associated with each of the MEL items; and

the operational impact is associated with the plurality of deferred maintenance records based on the at least one operational limitation associated with each of the MEL items.

9. The apparatus of claim 7, wherein the operational impact corresponds with an impact of operating the vehicle.

10. The apparatus of claim 9, wherein:

the vehicle comprises one of a plurality of vehicles of a vehicle fleet;

the maintenance query module accesses at least one deferred maintenance record for each of the plurality of vehicles from a maintenance information system and determines an MEL item from each of the deferred maintenance records;

the MEL data module locates the MEL items in respective MEL documents each associated with one of the plurality of vehicles and determines at least one operational limitation associated with each MEL item; and

the impact assessment module determines an operational impact associated with the at least one deferred maintenance record for each of the plurality of vehicles, the impact assessment module further configured to determine a fleet operational impact associated with the deferred maintenance records of the plurality of vehicles based on an aggregation of the operational impacts of the plurality of vehicles.

11. The apparatus of claim 7, wherein the MEL data module searches the MEL item in the MEL document for key terms, and wherein the at least one operational limitation is determined based on results of the search for the key terms.

12. A system, comprising:

a maintenance information system that stores a deferred maintenance record comprising a minimum equipment list (MEL) item identifier associated with a deferral of maintenance of a system fault on a vehicle; and

a deferred maintenance apparatus that determines the MEL item identifier, locates an MEL item associated with the MEL item identifier in an MEL document, determines at least one operational limitation associated with the MEL item, and determines an operational impact associated with the deferral of maintenance of the system fault based on the at least one operational limitation, wherein the deferred maintenance apparatus assigns one of a plurality of operational impact values to the operational limitation, and wherein the operational impact is determined based on an assigned operational impact value.

13. The system of claim 12, wherein the deferred maintenance apparatus automatically queries the maintenance information system to determine the MEL item identifier.

14. The system of claim 12, further comprising a data network, wherein the maintenance information system and deferred maintenance apparatus communicate with each other over the data network.

15. The system of claim 12, wherein the maintenance information system stores a plurality of deferred maintenance records each associated with a deferral of maintenance of the system fault associated with a respective vehicle of a plurality of vehicles of a vehicle fleet, and wherein the deferred maintenance apparatus determines the MEL item identifier for each of the plurality of deferred maintenance records, locates the MEL items associated with

the MEL item identifiers in respective MEL documents, determines at least one operational limitation associated with each MEL item, and determines an operational impact associated with the deferral of maintenance of the system fault for each of the plurality of vehicles of the vehicle fleet based on the at least one operational limitation associated with the respective MEL item.

16. The system of claim 15, wherein the deferred maintenance apparatus determines a fleet operational impact based on an aggregation of the operational impacts associated with the deferral of maintenance of the system faults for all vehicles of the vehicle fleet.

17. A method, comprising:

determining, using a minimum equipment list (MEL) data module, at least one operational limitation associated with deferred maintenance on a vehicle; and

determining, using an impact assessment module, an operational impact associated with the deferred maintenance based on the at least one operational limitation and assigning, using the impact assessment module, one of a plurality of operational impact values to the operational limitation, wherein the operational impact is determined based on an assigned operational impact value;

wherein at least one of the MEL data module and impact assessment module comprises one or more of hardware and executable code, the executable code stored on one or more computer readable storage media.

18. The method of claim 17, further comprising categorizing, using the MEL data module, the at least one operational limitation into one of a plurality of operational impact categories, and wherein the operational impact is associated with the one of the plurality of operational impact categories.

19. The method of claim 17, further comprising:

determining, using the MEL data module, a plurality of operational limitations; and

assigning, using the impact assessment module, one of a plurality of operational impact values to each of the plurality of operational limitations;

wherein the operational impact is based on an aggregation of the operational impact values assigned to each of the plurality of operational limitations.

20. The method of claim 17, further comprising:

accessing, using a maintenance query module, at least one deferred maintenance record associated with the deferred maintenance from a maintenance information system and determining, using the maintenance query module, an MEL item from the at least one deferred maintenance record; and

locating, using the MEL data module, the MEL item in an MEL document and determining, using the MEL data module, the at least one operational limitation from the MEL item.

21. The method of claim 20, further comprising searching, using the MEL data module, the MEL item in the MEL document for key terms, and wherein the at least one operational limitation is determined based on results of the search for the key terms.

22. The method of claim 20, wherein the operational impact corresponds with an impact of operating the vehicle.

23. The method of claim 22, wherein the vehicle comprises one of a plurality of vehicles of a vehicle fleet, the method further comprising:

accessing, using the maintenance query module, at least one deferred maintenance record for each of the plurality of vehicles from a maintenance information system and determining, using the maintenance query module, an MEL item from each of the deferred maintenance records;

locating, using the MEL data module, the MEL items in respective MEL documents each associated with one of the plurality of vehicles and determining, using the MEL data module, at least one operational limitation associated with each MEL item;

determining, using the impact assessment module, an operational impact associated with the at least one deferred maintenance record for each of the plurality of vehicles; and

determining, using the impact assessment module, a fleet operational impact associated with the deferred maintenance records of the plurality of vehicles based on an aggregation of the operational impacts of the plurality of vehicles.