

packs. Upon detecting that a first responder has cut a low voltage cut loop, fuses to the battery packs are blown and the high voltage power system is no longer powered. The cut loop may be routed to the tail of the aircraft to provide separation from high voltage lines and increase safety for the first responder.

SUMMARY

[0006] The present disclosure generally relates to a power system for an aircraft. One example of the present disclosure provides a power distribution system for an aircraft, comprising a plurality of electric propeller units (EPUs). The system including a first paired battery pack unit comprises a first battery electrically connected to a second battery via a first high voltage bus, wherein the first battery is configured to provide power to a first set of EPUs of the plurality of EPUs, wherein the second battery is configured to provide power to a second set of EPUs of the plurality of EPUs. The system including a second paired battery pack unit, the second paired battery pack unit comprising a third battery electrically connected to a fourth battery via a second high voltage bus, wherein the third battery is configured to provide power to a third set of EPUs of the plurality of EPUs, wherein the fourth battery is configured to provide power to a fourth set of EPUs of the plurality of EPUs. Further, the first high voltage bus and the second high voltage bus are electrically separate from one another.

[0006a] In an aspect, the present disclosure refers to a control system for charging an aircraft, comprising:

- a battery pack;
- an input device configured to enable a user to select between different charge modes;
- two main contactors connecting the battery pack to an electric propulsion unit, EPU, load, and a non-propulsive load;
- an EPU load contactor connecting the battery pack to the EPU load; and a controller configured to receive the selected charge mode and control the contactors, wherein the controller is further configured to:
 - keep the two main contactors open, causing the EPU load and the non-propulsive load to remain disconnected, upon receiving a user selection to charge in a first mode;

close the two main contactors and keep the EPU load contactor open, connecting the non-propulsive load and causing the EPU load to remain disconnected, upon receiving a user selection to charge in a second mode; and

close the two main contactors and the EPU load contactor, connecting the non-propulsive load and the EPU load, upon receiving a user selection to charge in a third mode.

[0006b] In an aspect, the present disclosure refers to a controller for charging an aircraft, wherein the controller is configured to:

receive a charge mode from an input device configured to enable a user to select between different charge modes;

control two main contactors connecting a battery pack to an electric propulsion unit, EPU, load, and a non-propulsive load;

control an EPU load contactor connecting the battery pack to the EPU load;

keep the two main contactors open, causing the EPU load and the non-propulsive load to remain disconnected, upon receiving a user selection to charge in a first mode;

close the two main contactors and keep an EPU load contactor open, connecting the non-propulsive load and causing the EPU load to remain disconnected, upon receiving a user selection to charge in a second mode; and

close the two main contactors and the EPU load contactor, connecting the non-propulsive load and the EPU load, upon receiving a user selection to charge in a third mode.

BRIEF DESCRIPTIONS OF FIGURES

[0007] **Figure 1a** illustrates an example eVTOL aircraft, consistent with embodiments of the present disclosure.

[0008] **Figure 1b** illustrates another example eVTOL aircraft, consistent with embodiments of the present disclosure.

[0009] **Figure 1c** illustrates an electric engine 110 with two partial motors, consistent with embodiments of the present disclosure.

[0010] **Figure 1d** illustrates a diagram of a high voltage power distribution system for an eVTOL aircraft, consistent with embodiments of the present disclosure.

[0011] **Figure 2a** illustrates a circuit diagram for a High Voltage Junction Box (HVJB), consistent with embodiments of the present disclosure.

[0012] **Figure 2b** illustrates a diagram of a High Voltage Junction Box (HVJB), consistent with embodiments of the present disclosure.

[0013] **Figure 3** illustrates a diagram of a Charge Port Assembly (CPA), consistent with embodiments of the present disclosure.

CLAIMS:

1. A control system for charging an aircraft, comprising:
 - a battery pack;
 - an input device configured to enable a user to select between different charge modes;
 - two main contactors connecting the battery pack to an electric propulsion unit, EPU, load, and a non-propulsive load;
 - an EPU load contactor connecting the battery pack to the EPU load; and a controller configured to receive the selected charge mode and control the contactors, wherein the controller is further configured to:
 - keep the two main contactors open, causing the EPU load and the non-propulsive load to remain disconnected, upon receiving a user selection to charge in a first mode;
 - close the two main contactors and keep the EPU load contactor open, connecting the non-propulsive load and causing the EPU load to remain disconnected, upon receiving a user selection to charge in a second mode; and
 - close the two main contactors and the EPU load contactor, connecting the non-propulsive load and the EPU load, upon receiving a user selection to charge in a third mode.
2. The control system of claim 1, wherein the input device is a physical switch, button, or lever, or wherein the input device is a user interface element output at a display.
3. The control system of claim 1 or 2, wherein the controller is further configured to monitor a state of the battery pack and command the two main contactors and the EPU load contactor based on the state of the battery pack.
4. The control system of any of claims 1 to 3, wherein:

the controller is further configured to prevent charging if a fault condition is detected in the battery pack; or

the controller is further configured to prevent charging if a fault condition is detected in the battery pack, and wherein the fault condition includes at least one of an overcurrent, an overvoltage, or a temperature exceeding a predetermined threshold.

5. The control system of any of claims 1 to 4, further comprising a thermal management module that is configured to adjust a charging process for the battery pack by sending cooling commands to an external system based on a temperature of the battery pack.
6. The control system of any of claims 1 to 5, wherein the control system is configured to determine a charge level for the battery pack based on historical battery information.
7. The control system of any of claims 1 to 6, wherein the controller is configured to enable communication between the battery pack and another battery pack, wherein the communication allows the battery packs to share information about their respective states to help determine an overcurrent condition.
8. The control system of any of claims 1 to 7, wherein the control system is configured to activate a redundant active trigger board that enables a pyro fuse driver to trigger one or more pyrotechnical fuses when the controller fails to activate the pyro fuse driver.
9. A controller for charging an aircraft, wherein the controller is configured to:
 - receive a charge mode from an input device configured to enable a user to select between different charge modes;
 - control two main contactors connecting a battery pack to an electric propulsion unit, EPU, load, and a non-propulsive load;
 - control an EPU load contactor connecting the battery pack to the EPU load;

keep the two main contactors open, causing the EPU load and the non-propulsive load to remain disconnected, upon receiving a user selection to charge in a first mode;

close the two main contactors and keep an EPU load contactor open, connecting the non-propulsive load and causing the EPU load to remain disconnected, upon receiving a user selection to charge in a second mode; and

close the two main contactors and the EPU load contactor, connecting the non-propulsive load and the EPU load, upon receiving a user selection to charge in a third mode.

10. The controller of claim 9, wherein the input device is a physical switch, button, or lever, or wherein the input device is a user interface element output at a display.
11. The controller of claim 9 or 10, wherein the controller is further configured to monitor a state of the battery pack and command the two main contactors and the EPU load contactor based on the state of the battery pack.
12. The controller of any of claims 9 to 11, wherein:
 - the controller is further configured to prevent charging if a fault condition is detected in the battery pack; or
 - the controller is further configured to prevent charging if a fault condition is detected in the battery pack, and wherein the fault condition includes at least one of an overcurrent, an overvoltage, or a temperature exceeding a predetermined threshold, and/or the fault condition is based on information received from a current sensor.
13. The controller of any of claims 9 to 12, wherein the controller is powered by the battery pack.
14. The controller of any of claims 9 to 13, wherein the controller is configured to enable communication between the battery pack and another battery pack, wherein the

communication allows the battery packs to share information about their respective states to help determine an overcurrent condition.

15. The controller of any of claims 9 to 14, wherein the controller is configured to activate a redundant active trigger board that enables a pyro fuse driver to trigger one or more pyrotechnical fuses when the controller fails to activate the pyro fuse driver.