SAE Aerospace
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AEROSPACE RECOMMENDED PRACTICE

ARP4101/5

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AIRCRAFT CIRCUIT BREAKER AND FUSE ARRANGEMENT

RATIONALE

This document has been reaffirmed to comply with the SAE 5-Year Review policy.

1. SCOPE:

This document recommends criteria for the location, arrangement and other requirements of aircraft circuit breakers and fuses on the flight deck.

2. REFERENCES:

2.1 Documentation:

This annex should be used in conjunction with:

- SAE S-7 ARP4101, Flight Deck Layout and Facilities
- SAE S-7 ARP4102, Flight Deck Panels, Controls, and Displays
- SAE S-7 ARP4103, Flight Deck Lighting and Visual Interface

2.2 Definition:

2.2.1 Circuit Breaker: A circuit breaker is a resettable circuit-protection device. Circuit breakers can be divided by function into four classes:

- Control Circuit Breaker: A control circuit breaker is one whose function is to protect the wiring used to operate control devices, such as relays.

- Power Circuit Breaker: A power circuit breaker, as distinguished from a control circuit breaker, is one whose function is to protect the wiring carrying the power to the equipment.

- Remote Circuit Breaker: A remote circuit breaker is one which is not controllable by the crew during flight.

- Resettable Remote Circuit Breaker: A remote circuit breaker which is resettable from the normal crew station.

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2.2.2 Fuse: A fuse is a replaceable circuit protection device utilizing the melting of a conductor for circuit interruption.

2.2.3 Limiter: A "limiter" is a type of fuse having a higher melting point and longer inverse-time characteristic than a standard fuse.

3. OPERATIONAL REQUIREMENTS:

3.1 General:

3.1.1 Nomenclature published in airframe manufacturers' technical material shall agree with corresponding nomenclature used on the flight deck to identify circuit breakers and fuses.

3.1.2 All circuit breakers shall be capable of being tripped and reset manually. A tripped circuit breaker must be unmistakably apparent from the station of the crew member(s) required to observe it. All circuit breakers subject to accidental actuation due to their location must be protected against inadvertent tripping.

3.1.3 Unless other means of compliance can be demonstrated, circuit breakers and fuses essential to continued safe flight shall be remotely resettable or located so that tripped circuit breakers and open fuses are readily discernible and resettable or replaceable from the crew's normal position in all operational lighting conditions. Consideration and great care in design should be given to providing convenient means for resetting digital systems.

3.1.4 Circuit breakers and fuses of systems not essential to the operation of the aircraft may be located anywhere in the aircraft provided that they can be inspected for tripped/open condition and are accessible in flight for resetting or replacement. Protective covers and placards discouraging unnecessary opening and closings of the circuits are desirable (examples: passenger reading lights, beverage heating, electric-shaver inverter). Circuit breakers and fuses in systems not usable while the aircraft is in self-powered operation need not comply.

3.1.5 It shall be possible for the flight crew from their normal position to readily identify those circuit breakers which intentionally have been pulled for system deactivation by maintenance for degraded flight dispatch; this also shall apply for supplemental indicating devices.

3.1.6 Limiters may be remotely located, provided that the limiter can be checked by noting the functioning of some dependent operating device or equipment. In the event that only non-operating standby equipment (such as spare inverter) is supplied through the limiter, a failure-indicating device shall be located to conform to the requirements specified in 3.1.3.

4. PANELS:

4.1 An area, or areas, consisting of one or more panels, shall be provided for location of circuit breakers and fuses in compliance with 3.1.3 and 3.1.4.

4.2 The area designated for circuit breakers and fuses, where practical, should be grouped by system sets; subsets of which should be in AC and DC groupings. Physical separation of groupings within a given system which may be required by bus isolation considerations should be minimized.

Within the set and subset groupings, essential circuit breakers and fuses shall be placed in the most conspicuous and accessible position.

4.3 Circuit breaker panels shall incorporate a grid system of marking to identify the physical location of each circuit breaker on a given panel. Horizontal rows are to be lettered A, B, C ... from top to bottom (fwd to aft if located on overhead panel). Vertical rows are to be numbered 1, 2, 3 ... from left to right (see Figure 1).

4.4 Identifying placards shall be affixed above each circuit breaker or fuse. Groups, sets, or subsets of related circuit breakers or fuses shall be further identified by a conspicuous white boundary enclosing each such group, and appropriate nomenclature shall identify each such group.

4.5 Suitable lighting shall be provided for circuit breaker and fuse panels as per ARP4103.

5. CONTROLS:

5.1 Circuit breakers, fuses and remote control circuit breaker indicators and controls shall be oriented from left to right, related to the crew member when facing the circuit breaker, fuse or control panel.

5.2 Actuation of circuit breakers of the switch type shall be consistent for a specific aircraft model.

Direction of actuation of circuit breakers of the "push-pull" type shall be "push-for-on" and "pull for off".

5.3 Normal system operation shall not require the use of circuit breakers as control switches.