

Burn-through responses of aero-engine nacelle using fiber metal composites by ISO2685 propane-air burner

ABSTRACT

The paper presents experimental investigation on the behavior and burn through responses of a flat plate composite of fiber-metal laminates composites of aluminum alloy 2024-T3 with carbon and natural fibers subjected to environmental conditions in fire designated zone of an aircraft engine exposed to fire. The main purpose of this study is to know the different burn through time responses of different forms of aluminum alloy with synthetic and natural fibers. The composites were designed and developed to improve the flame fire resistance in a fire designated zone of an aircraft engine in near future for prolonged burning through time that will at least withstand the fire flame for 15 minutes according to the ISO 2685 standard. The composites are fabricated by hand lay-up method in a mold of 300 mm x 300 mm and compressed by compression machine. Based on the obtained results, some of the composites are indicated to be fireproof while some others are fire resistant. It is shown that the carbon fiber reinforced aluminum alloy laminate with only aluminum at top and bottom (CF+AA) of the composites can resist more flame temperature than the carbon fiber reinforced aluminum alloy laminate with alternate layers of aluminum and carbon fiber (CARALL) with 7.86%, the sandwich of carbon fiber with flax with 18.2% and the sandwich of carbon fiber with kenaf with 23.43%. In conclusion, the study reveals that aluminum alloy 2024-T3 with carbon fiber and some types of natural fibers composites possess good properties of resisting high temperature of fire designated zone of an aircraft engine nacelle.

Keyword: Aluminum alloy; Composites; Fire designated zone; Natural fiber; Synthetic fiber