

EVALUATION OF A LOW COST THERMOPLASTIC COMPOSITE FOR AIRCRAFT INTERIOR APPLICATIONS

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1. ABSTRACT

Linear polyphenylene sulfide (PPS) is being used as a matrix in composite structures because of its relatively low cost, ease of processing, excellent mechanical properties and chemical resistance to aerospace fluids. While PPS based carbon and glass reinforced composites have been used in production on external aircraft components, recent interest involves use of the material inside the aircraft because of its ability to meet flame, smoke and toxicity requirements.

This paper discusses seat frames as an aircraft interior application for carbon/PPS composites. Material properties are reviewed. Qualification test results are also discussed, as well as flame, smoke and toxicity requirements for the application.

2. BACKGROUND

The incorporation of light weight plastic and composite materials in commercial aerospace vehicles is becoming a common design practice for reducing vehicle weight and achieving fuel savings (Reference 1). The utilization of these materials in the aircraft cabin has historically been defined by strict guidelines established by both the FAA and aircraft manufacturers (Reference 2). This issue has become under increased scrutiny in the past decade as security threats have increased. Areas of concern include flammability, smoke generation, toxicity (FST) and heat generation of the organic based polymers. Basically, the materials should not be able to sustain a flame when exposed to fire. If exposed to fire, any smoke generation must be minimal so that passengers and crew can visibly follow an escape path. All smoke must contain a minimal amount of toxic fumes to reduce hazard to those exposed and allow them to exit in a reasonable amount of time. Lastly, the exposure to flame must not result in an exothermic (heat generation) reaction that would further sustain the flame or cause discomfort to those exposed.

Early aircraft interior cabins were typically sheet metal, with any number of fabrics, foams and plastic materials in different locations. Over the past 50 years, the type of organic materials migrated to flame resistant versions. More recently, metallic structures are being replaced for vehicle weight reduction. The focus of this paper involves the seat frame.

Approximately 400,000 seat frames are manufactured each year for the aerospace industry. The vast majority of these frames are metallic predominantly aluminum. Composite seat frame