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Challenges of Applying Composite Materials to the Next Generation of Aeroengines

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For today’s air transport (freight or passenger) customer the propulsion figure of merit that is of greatest importance is mission weighted fuel burn. The physics of the range equation demand that propulsion supplies provide high thermal and propulsive efficiencies and low propulsion system weight. Historically, materials used in propulsion systems have been metallic in nature and most of these metallic materials need performance robbing cooling flows to survive in the hottest areas of an engine. However, recent advances in hot and cold composite materials for use in next generation aeroengines hold the promise of considerably reducing engine set weight and reducing, or eliminating, the need for cooling flows in engine hot sections. In addition, composite materials can eliminate the need for rare, and expensive, metallic alloying elements such as Rhenium used in today’s aeroengines.

This presentation will focus on some of the top level design, manufacturing, and certification challenges faced by aeroengine manufacturers as they move from metallic to composite material designs. The intellectual property on composite materials and design systems is tightly held by all the major aeroengine companies. Even so, there is ample evidence of successful applications of composites in current aeroengines and considerable promise for the future application of these lightweight materials in new engine systems.