Firefighting Practices for New Generation Commercial Composite Structures

Boeing has received a number of inquiries from the airport fire community and airport operators related to the fire behavior associated with the increased usage of composite materials in the main structure of the 787 aircraft.

In reference to the composite structure, Boeing is not recommending any major changes to the standard way of fighting an aircraft fire. Extensive testing has been conducted in regards to combustibility and toxicity related to the composite structure. The tests have proven very successful and warrant the basis of our position. The structure is monocoque in its design with multiple layers of uni-dimensional woven fabric. This design not only adds to the strength of the product, but also makes it a good barrier to fire and heat. The structure does not aid in the spread of fire and acts as a barrier creating greater difficulty for an exterior fire to penetrate an intact fuselage. From a toxicity perspective, the composite structure during fire testing poses no greater hazard than an aluminum fuselage aircraft. Also, note that the burn through time on the composite structure is significantly longer than with the aluminum fuselage which may inherently provide greater safety to both the rescue fire responders and passengers in some scenarios.

Upon approach of a fire involving a 787 aircraft, the rescue fire services should deploy their standard tactics as if they were addressing an aircraft with an aluminum fuselage. This may be through the use of turrets or handlines, depending on the situation. Initial fire engagement should include foam to knock down the flames and suppress any fuel vapor that may be on the ground around the accident scene.

Gaining access to the 787 for rescue purposes should be in accordance with the local rescue fire service procedures. Our testing concludes that cutting the composite structure is much easier than cutting the aluminum fuselage. Testing has been conducted with the typical rescue tools: circular saw, air chisel, and chainsaw. The most effective method to cut through the composite structure is to utilize a circular saw with either a carbide tip blade or diamond tip blade.

When performing handline operations and rescue activities, personnel should be in full protective clothing with bunker gear and self-contained breathing apparatus (SCBA). The same level of personal protective equipment (PPE) with SCBA should be worn regardless of aircraft material.

All aircraft accidents involving fire should be considered a hazardous materials incident whether the situation involves an aluminum fuselage or composite fuselage. With respect to this, hot, warm, and cold zones should be established and maintained through the completion of the accident investigation. Personnel entering to investigate the accident after the scene has been stabilized, should be monitored, tracked, and

checked to ensure they have appropriate protection equipment, i.e. coveralls, gloves, hoods, and respirators are common PPE for these types of situations.

Additional Information:

The Air Force has additional information available related to Military derivative composites and provides information that may be helpful. Access to the link provided is through enrollment. http://www.dodffcert.com/00-105E-9/index.cfm Chapter 3. Hazardous Material and Mishap Hazards and 3.5 Composite Material Hazards is where the appropriate data resides. NOTE: This data does not depict, nor indicate, the behavior of the new generation composite being used on the 787 and is only provided as a resource for review.

The Federal Aviation Administration has done recent testing on more current composite materials similar in design to the new commercial aircraft. These data are closer to the information gleaned from our toxicity testing. These test data can be accessed at: http://www.fire.tc.faa.gov/pdf/TN07-15.pdf

Note: Boeing test data, as well as other data sources, reference that the composite material itself does not usually burn, but the resin used to bond the carbon material will melt and may ignite. When the surface area of the composite structure is exposed to heat and/or flame, it will maintain its structure though it may be weakened. However, the composite structure will not melt as with aluminum fuselages. Because of this, rescue fire personnel must use caution when traveling across the surface area of the composite structure. Make sure to test the surface area if suspected exposure to heat and flame are present.

Additional questions regarding issues related to Aircraft Rescue and Fire Fighting (ARFF) and Boeing aircraft can be directed to either of the following:

Ivan Stephenson
Assistant Chief of Training & Safety
Security & Fire Operations | Boeing Fire Department
M: (310)345-8786
@: ivan.stephenson@boeing.com

Daniel L. Smith
Assistant Chief of Administration
Security & Fire Operations | Boeing Fire Department
M: (843)609-8982
@: daniel.l.smith12@boeing.com

or

Boeing Airport Technology
P.O. Box 3707, MC 20-93
Seattle, Washington USA 98124-2207
Phone: 425-237-1004
Fax: 206-662-0280
AirportCompatibility@boeing.com