THE NINTH TRIENNIAL INTERNATIONAL AIRCRAFT FIRE AND CABIN SAFETY RESEARCH CONFERENCE

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May 8, 2019

The BTU heat transfer device: adapting a standard tool in aircraft fire testing to small scale experiments

Thematic Areas:
Flammability Test Method Development and Analysis

ABSTRACT

Fire protection tests are either performed on-site of the aircraft component manufacturer or in dedicated external fire laboratories to evaluate new materials and fire proofing strategies. For powerplant installation and propulsion system components, FAA Advisory Circular AC20-135 states most of the considerations for the burner design and test rig. Test procedures demand for a standard flame provided by an approved and calibrated burner. The burner calibration for heat flux is commonly done using a standard apparatus (BTU heat transfer device) as outlined by the FAA AC20-135, an approach also adopted by other standardization bodies. The concept of this apparatus is based on the principle of heat flow calorimetry: the heat transfer from the flame to a well-defined isothermal section of the apparatus is determined from the measured raise in temperature in that section. The geometry, conductivity and surface condition of the exposed are usually considered in a sole apparatus constant. A detailed review and experimental study have been performed to identify and assess the effect of key parameters potentially altering the heat flux obtained using such a calorimeter over the duration of certification tests.

A critical limitation of this approach is scalability, as the geometry of the calorimeter is prescribed in the certification requirements. In this work we discuss the necessary modification to adapt the BTU heat transfer device to small scale experiments that can be conducted on coupons in the laboratory. The results presented are from both experiments under full scale certification conditions and from small-scale tests, to study the scalability and limiting effects of this burner calibration approach. The emphasis is on the identification of scope of application for the underlying assumptions as well as on the suggestion of mitigation strategies for its extension.

***K*eywords** Fires testing · Heat flux