"FAA Next-Generation fire test burner applied to Powerplant component fire testing"

The FAA Fire Safety Team has been tasked by the Transport Airplane Directorate to investigate the use of the FAA-designed next-generation (NexGen) burner for use in testing Powerplant fire testing, including hose assemblies, firewalls, and components in fire zones. The current regulations have not been updated since the 1970's, and they specify FAA-acceptable kerosene burners that are no longer commercially available. Also, over the past 30 years, industry has tended towards the use of a propane-fueled burner which has become accepted as equivalent to the kerosene-fueled burner. Independent research by the FAA and CEAT has shown that although a thermocouple inserted into each of the burners may measure 2000°F, the propane burner will always be less severe than the kerosene burner. This is due to the opacity of the kerosene flame, which does not allow a heated test specimen to re-radiate back through the flame to the cold environment, resulting in a net heat loss that is significantly less than a propane flame, which allows almost complete re-radiation and heat loss to the surroundings from a heated test specimen. This effect is also not indicated when measuring flame heat flux with a water-cooled device, since the device surface will remain at cooling water temperature, thus not heating up to the point where heat loss by re-radiation is significant.

The goal of this research is to develop the operational parameters for the NexGen burner by performing comparative testing of actual Powerplant components, hoses, and firewalls, and determining what setting provides a flame severe enough to meet the rule's original intention, which is a jet fuel engine fire in a fire zone. The calibration will rely upon strict control of the burner inlets, including fuel and air temperature and pressure, and burner design and configuration, and not upon an absolute measurement of a flame temperature or heat flux, as these measurements have high levels of uncertainty and are not indicative of the severity of the flame, as evidenced by direct comparison of a propane and kerosene burner calibrated to the same temperature and heat flux but giving drastically different test results.