Advanced Combustion and Aerothermal Technologies

Abstract: In the past, it has been demonstrated that combustion technology based on premixing reactants with combustion products may improve both combustion efficiency and emissions for some industrial applications. Work currently in progress in the European Union aims at developing applications to use this combustion strategy for gas turbines and aerospace applications. The challenge is to provide a new class of combustors performing at a high combustion efficiency and low emission indices, together with multifuel capability (gas and liquid fuels), and low pressure drop. The trapped vortex combustor (TVC) may be considered a very promising form of technology for both pollutant emissions and pressure drop reduction. This strategy is based on mixing hot combustion products and reactants at a high rate. Turbulence occurring in a TVC combustion chamber is trapped within a cavity where reactants are injected and efficiently mixed. Since part of the combustion occurs within the recirculation zone, a flameless regime can be achieved, while a trapped turbulent vortex may provide significant pressure drop reduction. The work presented in this paper is the result of having investigated all of these aspects.

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