

Abstract Submitted  
for the DFD20 Meeting of  
The American Physical Society

**Characterization of Swirl Number Effect on a Cyclone Vortex Combustion Chamber Flow Field.** OMER KHAN, Auburn University, ANWAR AHMED TEAM — An innovative characteristic of the cyclone vortex combustion chamber is the tangential injection of oxidizer near the nozzle that gives rise to a distinct vortical-helical motion over the entire length of the chamber, which reverses its direction at the head wall and forms a core vortex traveling down the chamber before exiting through the nozzle. The primary advantages of the vortex combustion chamber are prolonged fuel residence time, increased fuel/oxidizer mixing length and thermal shielding of chamber walls. It has been determined that the internal flow field of such Cyclone Vortex Chamber is highly swirl driven due to the tangential injection of the oxidizer, also significant dissipation of tangential momentum is undesirable as the stability of the internal flow field is dependent on the coherency of the vortex structure. The effect of Swirl number (i.e ratio of tangential momentum flux to axial momentum flux) has been characterized. It has been observed that varying the swirl number has a significant effect, not only on the magnitude of the normalized velocity but also on its spatial distribution, thus making the swirl number an important design parameter for the cyclonic chamber.

Omer Khan  
Auburn University

Date submitted: 12 Aug 2020

Electronic form version 1.4