

Assessment of Some Atomization Models Used in Spray Calculations

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Summary

The paper presents the results from a validation study undertaken as a part of the NASA's fundamental aeronautics initiative on high altitude emissions in order to assess the accuracy of several atomization models used in both sub-cooled and superheat spray calculations. As a part of this investigation we have undertaken the validation based on four different cases to investigate the spray characteristics of (1) aashing jet generated by the sudden release of pressurized R134A from cylindrical nozzle, (2) a liquid jet atomizing in a subsonic cross ow, (3) a Parker-Hannin pressure swirl atomizer, and (4) a single-element LDI (Lean Direct Injector) combustor experiment. These cases were chosen because of their importance in some aerospace applications. The validation is based on some 3D and axisymmetric calculations involving both reacting and non-reacting sprays. In general, the predicted results provide reasonable agreement for both mean droplet sizes (D_{32}) and average droplet velocities but mostly underestimate the droplets sizes in the inner radial region of a cylindrical jet.

