The exhaust flow field of a rotating detonation-wave engine

KAZHIKATHRA KAILASANATH, DOUGLAS SCHWER, U.S. Naval Research Laboratory — Rotating detonation-wave engines (RDE) are a form of continuous detonation-wave engine. They potentially provide further gains than an intermittent or pulsed detonation-wave engine (PDE). However, significantly less work has been done on this concept when compared to the PDE. Last year, we presented the details of the injection system on the overall flow field in an RDE. In this talk, we focus on the effects of adding an exhaust plenum to this idealized RDE. While the overall exhaust flow shows that a recirculation zone sets up behind the RDE when a plenum is added, the net effect on the flow field within the RDE and on performance is found to be small. However, the slight modification to the flow field may impact the design of suitable nozzles for this device. This is explored further with the addition of a simple conical nozzle. This nozzle reduces the size of the recirculation zone and also reduces the temperature in the plume but has little effect on the flow field inside the RDE.

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