RANS modeling

The RANS section contains two reports on three projects: RANS models have of course played a part in many other projects reported here. The work of Ooi *et al.* is addressed to Reynolds averaged analysis of flow in a ribbed duct. This configuration is used in cooling passages; the ribs enhance heat transfer. The terminology 'turbulator' is some times used to describe the role of the ribs. This project explores the possibility that the ribs function by generating strong secondary flows, not simply enhancing turbulence levels. Though experiments were done in which the secondary flow is switched off and heat transfer is compared to that of the full flow field. Swept ribs were found to produce a large amount of secondary flow heat transfer. The article by Ooi *et al.* provides some specific numbers, as well as visualizations of the secondary flow features.

Rousson *et al.* report on two projects related to fires. Reynolds averaged analysis and eddy simulation are discussed. Fires can propagate by radiative heating. Whether or not a surface will ignite can depend on whether convective cooling keeps the surface below the flash point. This group identified a benchmark data set on mixed convective cooling in a parameter range of interest to fires. They initiated a joint RANS/DNS/LES study of how well this flow can be predicted. Initial results are promising, but not definitive.

The fire group also explored the idea of time-filtered LES to simulate the puffing effect that is seen in large scale pool fires. The characterization of this phenomenon as low frequency unsteadiness suggests that one should think in terms of the time domain. It was found that puffing can be produced by LES. An auxiliary component to this and the RANS work is to further the development and application of the DOE fire prediction code called Fuego.

Paul Durbin