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Low-Order Models For Assessing RANS Closures DANIEL ISRAEL, Los Alamos National Laboratory — Historically, most coefficients in RANS models have been calibrated to match the growth rates of certain canonical self-similar flows. However, for many of these flows, the growth rates observed in experiments and DNS vary widely. In fact, George (1986) argues that a universal self-similar solution does not exist. This would imply that RANS model calibration is specific to a particular experiment. Using classical integral methods to reduce RANS models to ODEs, it is possible to obtain a low-order dynamical system which can be used to study the approach to self-similarity for the model. Comparing the trajectory maps for such low-order models to data suggests that most, if not all, of the discrepancy between different experiments can be explained by transient deviations from self-similarity, and that there is indeed a universal self-similar behavior. Furthermore, such trajectory maps can be used to assess how well transient behavior due to the initial conditions in RANS calculations captures the experimentally observed flow physics.

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