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Final Report
on
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STABILITY OF MIXING LAYERS

Period covered by this report
January 23, 1992 to January 22, 1993

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Technical progress during the funded period of this grant, January 23, 1992 to January 22, 1993, was reported in the annual progress report submitted to NASA on February 15, 1993. The principal investigators were notified in a letter dated April 14, 1994 that no further funding of this grant was anticipated. This report serves as the final report of this grant.

During the funded period of this grant, a parabolized mean flow code (needed for instability calculations) was being developed. Although the work was not completed at the end of the funded period (one year) the effort has been continued as a part of a related project. The marching scheme was subsequently modified for application to noncircular jet mean flow and instability computation. Very little work has been done on the prediction of the instability and mean flow of this class of jet flows. Noncircular jets have some very desirable aerodynamic and noise characteristics. They are being considered as probable jet flow configuration for the high-speed civil transport. To account for fine scale turbulent mixing in this type of flows, a k-ε turbulence model with high-speed high-temperature correction term has been incorporated into the computation scheme. It is known that the use of standard k-ε model coefficients would not lead to accurate prediction of the mean flow of circular jets. We have, therefore, replaced the standard coefficients by a set of new values found empirically. With the modified coefficients, our computer code has been able to yield mean flow predictions for both circular and non-axisymmetric jets which compare well with measurements. Results of this work will be presented in the forthcoming APS/DFD meeting and in journal publication.

The flow instability (spatial) work initiated by this grant is still continuing. Effort is now concentrated on non-axisymmetric jets. The primary applications are on turbulent mixing processes and noise radiation.