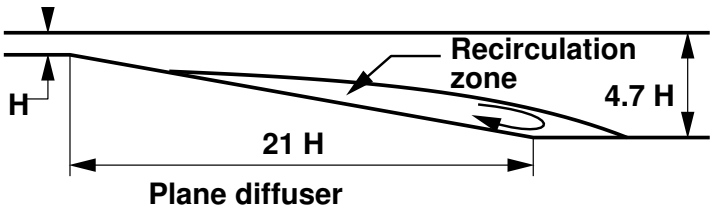
Case 8.2
Flow through an asymmetric plane diffuser members.xoom.com/mikksk/pelit.htm

Description of the Flow Field

An asymmetric two-dimensional diffuser flow is considered. This flow includes three important features: First, the well defined inlet conditions. The inlet channel flow is turbulent and fully-developed. Second, a smooth-wall separation due to an adverse pressure gradient is involved. The prediction of the separation point and the extent of the recirculation region is particularly challenging for computational models. Finally, this flow includes reattachment and redevelopment of the downstream boundary layer. The physics of reattachment and recovery are still not well understood and continue to pose a challenge to fluid mechanicians.



Flow parameters

The inlet channel flow is two-dimensional, incompressible, turbulent, and fully-developed channel flow with Reynolds number of 20,000 based on the centreline velocity and the channel height.

Instructions for Contributors

On the upstream boundary ($x/H < -5.87$), the fully developed channel flow must be specified. It is recommended that each contributor first separately computes the fully developed channel flow using the same turbulence model as he or she will use for the diffuser flow itself. This way, one obtains a consistent set of inflow boundary conditions for the actual flow problem. Another way is to compose a computational model of the diffuser that includes a sufficiently long inlet channel. If this method is employed, one should, indeed, place a sufficiently long channel portion in front of the diffuser ($110H$ in experiments) in order to ensure fully developed flow at the diffuser inlet. On the outflow boundary ($x/H > 74$) one may specify zero-gradient conditions.

References

[1] C.U. Buice and J.K. Eaton. Experimental investigation of flow through an asymmetric plane diffuser. Technical report, Center for Turbulence Research, Stan-