

Problem 2: Rotating stall in compressor blade passage

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Rotating stall is loss of axisymmetric flow stability in jet engine fan, where the circumferential flow pattern is disturbed. The basic explanation of the rotating stall mechanism is as follows. Consider a row of axial compressor blades operating at a high angle of attack, as shown in Fig. 1. Suppose that there is a non-uniformity in the inlet flow such that a locally higher angle of attack is produced on blade B which is enough to stall it. The flow now separates from the suction surface of the blade, producing a flow blockage between B and C. This blockage causes a diversion of the inlet flow away from B towards A and C, resulting in a increased angle of attack on C, causing it to stall. Thus the stall cell propagate along the blade row.

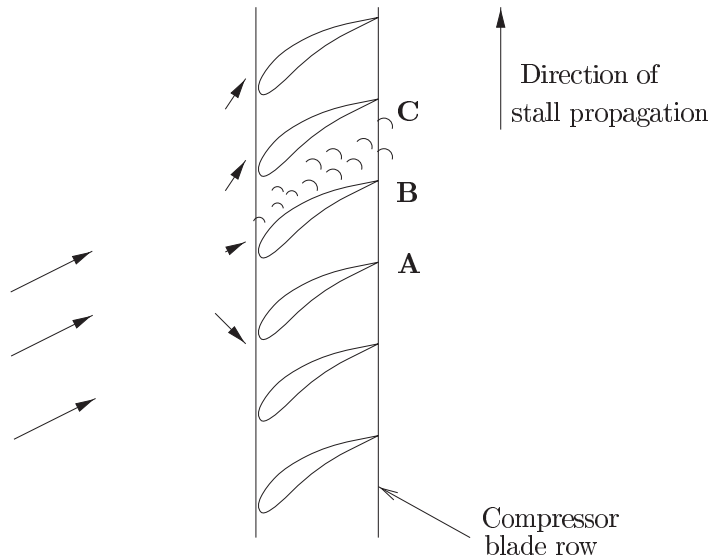


Figure 1: Physical mechanism for inception of rotating stall.

Development of separated flow models and effective numerical methods for rotating stall analysis are the topics of Problem 2.

References

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- [2] F. K. Moore and E. M. Greitzer, A Theory of Post-stall Transients in Axial Compressor Systems: Part I-Development of Equations, J. Eng. Gas Turbines and Power, 108, pp 68-76, 1986.
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