

Scaling of axial fan noise

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The main mechanisms of axial fan noise, namely trailing edge, tip vortex formation and turbulence ingestion noise, are predicted numerically, semi-empirically and analytically. Single-airfoil theory is used to combine the noise mechanisms to represent the noise generated by a fan at various volume flow rates and tip clearances. This prediction is validated by experimental measurements for one fan diameter. The effect of a change in fan diameter on the generated far field noise is investigated and compares favourably with an existing fan scaling method and proprietary equations used by cooling system suppliers.