

Syed Fawad Raza Ali Bokhari

**Modelling of flow noise inside an
aircraft air distribution system: A
non-linear empirical modelling
approach**

Band 27



**Institut für
Modellierung und
Berechnung**

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Abstract

Flow noise inside an air distribution system of an aircraft has become an important issue in cabin system designs. The flow noise may considerably be reduced by incorporating suitable modifications in different components. However, the modification process requires iterative evaluations of the flow noise through various computational tools, which face different challenges in terms of accuracy, time, and resource.

In this regard, an alternative approach of empirical modelling is proposed and concerning issues are explored and addressed successfully. A comprehensive framework of different interdisciplinary fields is presented, which incorporates statistics, model and parameter identification, neuro-fuzzy modelling, dimensional analysis, etc. The framework encompasses pre-experimental investigations, experiments themselves, modelling, and pre- and post-modelling analyses phases. It helps in a reliable empirical modelling process and brings a statistical confidence in all the phases.

Empirical models -for the flow noise prediction of different components of the air distribution system- are developed and validated. The models are used to demonstrate validated predictions for different cluster of components and simulate a representative example of an air distribution system. Finally, the research concludes that the presented framework can result in an effective alternative for modelling a complex phenomenon, e.g., modelling the flow noise behaviour inside an air distribution system of an aircraft.

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