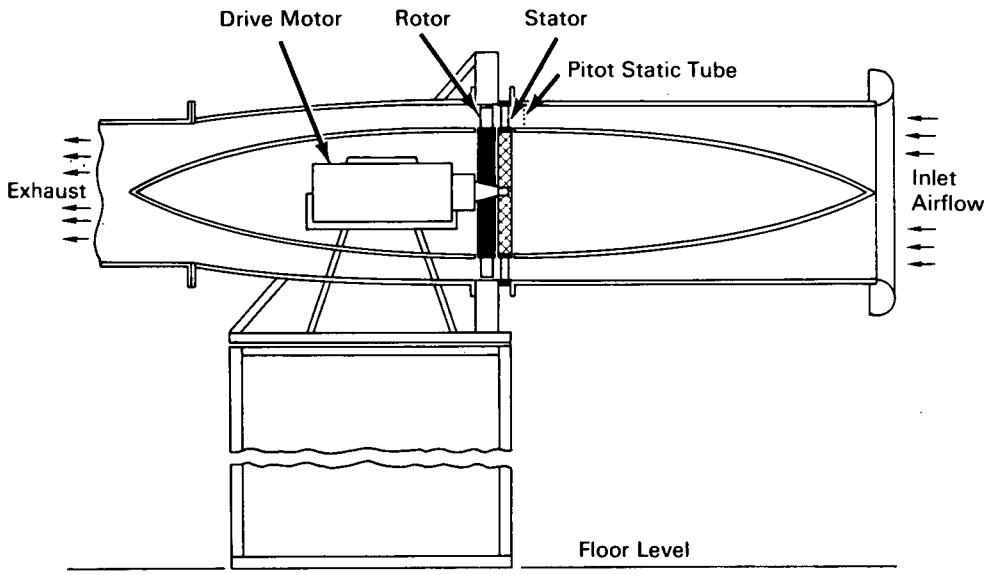
December 1967 Brief 67-10516

NASA TECH BRIEF

Noise Study of Single Stage Compressor Rotor–Stator Interaction



Noise from axial-flow compressors is a serious problem as it relates to the operation of jet transport aircraft from commercial airports. Because of the lack of information on the generation and propagation aspects of the problem, a study has been directed toward evaluation of rotor–stator interaction. Far-field noise radiation data from several rotor–stator configurations were compiled and compared where possible with available theory.

The test compressor setup is depicted in profile in the figure. The compressor was driven by a variable speed electric motor at speeds up to 8700 rpm, corresponding to a tip speed of 560 fps. A microphone for picking up acoustic data was mounted in such a way that it could be moved continuously within inlet centerline level and one quadrant of a 12-foot radius azimuth circle. Airflow measurements were made with an array of pitot static tubes located ahead of the stator.

The collected data were reduced to the form of radiation patterns and frequency spectra. The radiation patterns compare favorably with results calculated from theoretical considerations. These data show how the radiation patterns are affected by the relative number of rotor blades and stator vanes. Discrete random noise and frequency components were observed to increase in level with rotor speed and at essentially similar rates. The discrete frequency radiation patterns for a given rotor were found to vary with changes in stator configuration. Increased spacing between rotor and stator resulted in decreased noise levels and in elimination of most of the radiation pattern individual lobes.

(continued overleaf)

Note:

Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
Langley Research Center
Langley Station
Hampton, Virginia 23365
Reference: B67-10516

Patent status:

No patent action is contemplated by NASA.

Source: William L. Copeland
and John L. Crigler

(LaRC-137)