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Experiments of effects of inlet-air distortion on aerodynamic performance in transonic compressor

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中文摘要：

The inlet-air distortion which was caused by high angle-of-attack flight was simulated by plugboard.Experiments were conducted on a transonic axial-flow compressor's rotor at 98% rotating speed.The flow-field characteristics and mechanism of performance degradation were analyzed in detail.The compressor inlet was divided into four sectors at circumference under inlet-air distortion.They were undisto rted sector,transition sector A where the rotor was rotating into the distortion sector,distorted sector and transition sector B where t he rotor was rotating out of the distortion sector.The experimental results show that compared with undistorted sector,there is a subson ic flow in transition sector A,so the pressure ratio is decreased by a large margin in this sector.However, the shock wave is enhanced i n distortion sector and transition sector B, and thus the pressure ratio increases in these sectors.Because of the different works at ci rcumference,the phase angle of total pressure changes 90° when the inlet total pressure distortion passes through compressor rotor.In a ddition,the frequency and amplitude of disturbances in front of the rotor strengthenes under inlet distortion,so the unstable flow would take place in advance.In addition, the position of stall inception is in one of the transition sectors.

英文摘要：

The inlet-air distortion which was caused by high angle-of-attack flight was simulated by plugboard.Experiments were conducted on a transonic axial-flow compressor's rotor at 98% rotating speed.The flow-field characteristics and mechanism of performance degradation were analyzed in detail.The compressor inlet was divided into four sectors at circumference under inlet-air distortion.They were undistorted sector,transition sector A where the rotor was rotating into the distortion sector,distorted sector and transition sector B where the rotor was rotating out of the distortion sector.The experimental results show that compared with undistorted sector,there is a subsonic flow in transition sector A,so the pressure ratio is decreased by a large margin in this sector.However, the shock wave is enhanced in distortion sector and transition sector B, and thus the pressure ratio increases in these sectors.Because of the different works at circumference,the phase angle of total pressure changes 90? when the inlet total pressure distortion passes through compressor rotor.In addition,the frequency and amplitude of disturbances in front of the rotor strengthenes under inlet distortion,so the unstable