46ESS-01: Intake Systems for Subsonic Aircrafts

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An intake system consists of a duct which has to fulfil two main tasks: provide the mass flow rate which ensure maximum performance and the required thrust; deliver a uniform flow pressure distribution in order to ensure an acceptable engine life. Moreover, intake systems play a key role in the reduction of Specific Fuel Consumption (SFC) and noise levels produced by engines. Since there is a distinction between the performance and design requirements of intake systems for subsonic and supersonic flow conditions, this paper will solely cover the behaviour and the key drivers for the design under subsonic conditions. During the years, it has been demonstrated that pitot intakes are the most successful type for subsonic applications, since it minimises the risk of flow separation on the intake lip and so distortion at the fan face. Further considerations are made about role and working principle of auxiliary air intake systems and variable lip geometry. A final evaluation about the different applications of intake systems is also treated.