AÉRODYNAMIQUE TRANSSONIQUE

TRANSONIC AERODYNAMICS

Lecturers: Stéphane AUBERT

| Lecturers : 20.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 8.0 | Project : 0.0 | Language : AN

Objectives

Understanding the physical behaviour of compressible gas at high Mach number is crucial to design transonic and supersonic airplanes as well as modern gas turbines. This course objective is to cover the basic theories of supersonic aerodynamics, then to apply these to external flows (around airfoil and fuselage nose) and to internal flows (in compressors and turbines).

Keywords : compressible flows, supersonic, show wave, expansion wave, interactions, analytical methods

Programme

1. Toolbox : Reminders of fluid mechanics and thermodynamics
2. One-dimensional flow : Normal shock relations
3. Oblique shock and expansion waves : Prandtl-Meyer function ; waves reflections
4. External flows : Critical Mach number ; sound barrier ; bow shock
5. Quasi-one dimensional flow : nozzles
6. Transonic axial compressor flows

Learning outcomes

- To elaborate and to apply formulations adapted to compressible and transonic flows
- To understand transonic aerodynamics phenomena in external and internal flows
- To judge the accuracy of models to estimate quantities of interest from a design point of view

Independent study

Objectifs : This activity is not concerned with framed autonomy activities outside personal work.

Méhodes : This activity is not concerned with framed autonomy activities outside personal work.

Core texts

N.A. Cumpsty, *COMPRESSOR AERODYNAMICS*, Krieger Publishing Company, 2004
J.D. Anderson *MODERN COMPRESSIBLE FLOW*, Mc Graw Hill, 2021

Assessment

Final mark = 100% Knowledge
Knowledge = 100% final exam