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A New Finite Element Based Methodology For The Analysis Of Tangling In Jet Engine Turbines

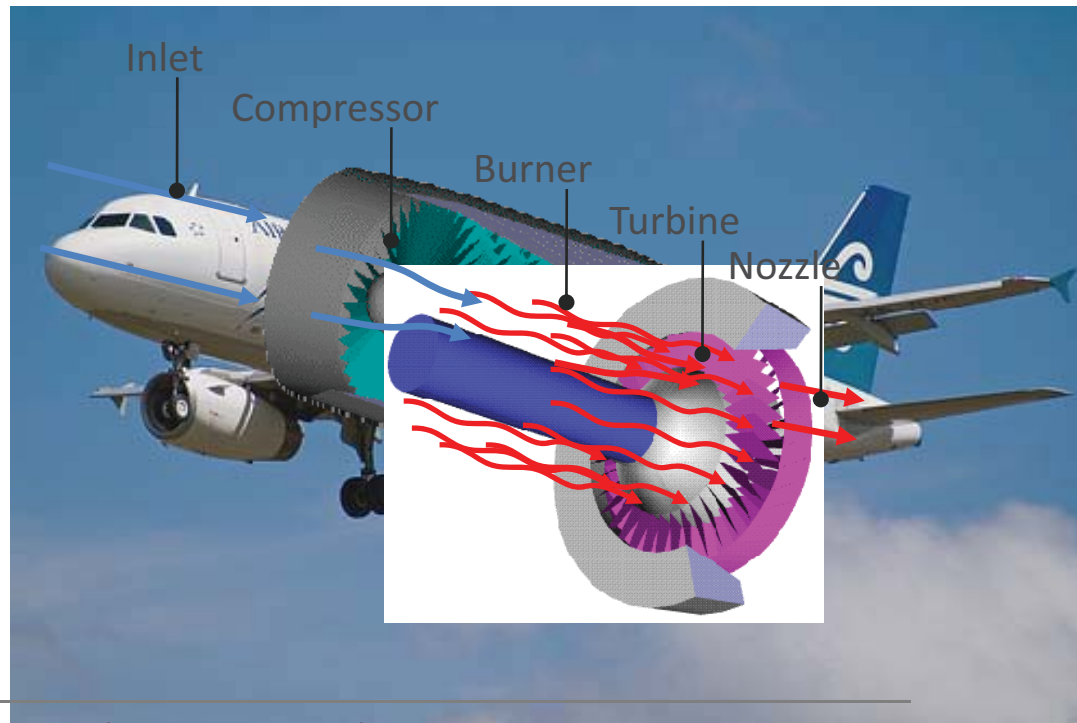
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INTRODUCTION

What is “*tangling*”?

Working conditions of jet engine turbines are very demanding



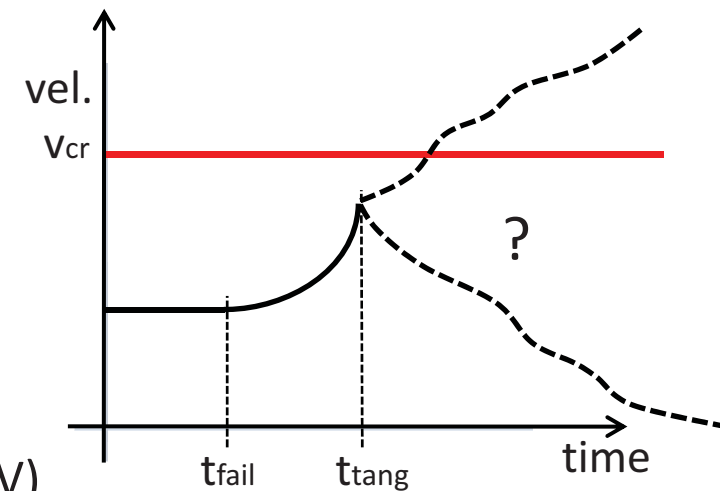
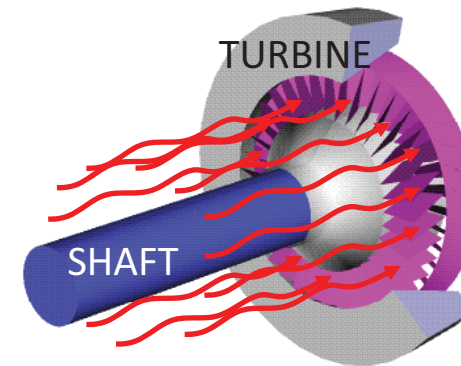
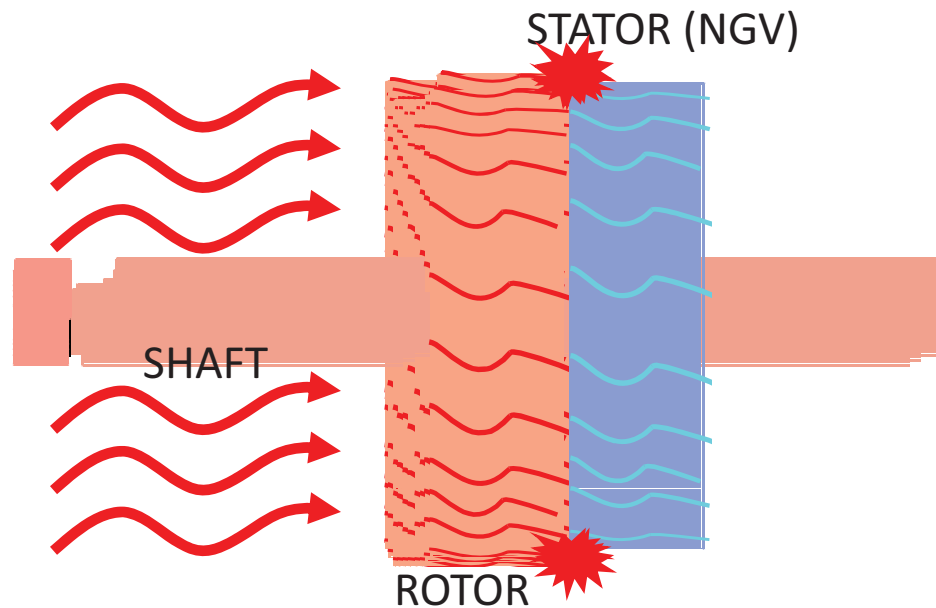
- High temperatures (up to 900 °C)
- High rotation velocities (around 10000 r.p.m.)
- Big efforts induced

→ Cool flow
→ Hot flow

INTRODUCTION

What is "tangling"?

Under these conditions, shaft failure is rare but not impossible



Tangling is the hypothetical braking capability developed during the crashing and friction between the rotor and the stator (NGV)

INTRODUCTION

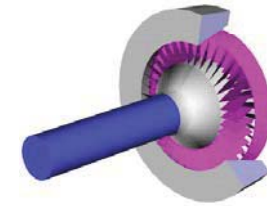
What is “*tangling*”?

If the rotor is not stopped, it leads to a catastrophic failure



INTRODUCTION

Why is so important to model *tangling*?



Despite engines have some security systems to stop the turbine in case of shaft failure, jet manufacturers are afraid that such systems are not fast enough to stop the turbine before reaching the critical speed. They try to design a mechanical braking system through *tangling*.

An experimental program based on trial-and-error would be a desirable way to study the problem. However, it would be too expensive.

Numerical modeling allows to study the problem by the simulation of virtual tests. It makes possible to study different solutions and configurations saving lots of time and money.