

# **Tell me what you see, and I'll tell you who are!**

## **Analysis of a cracking test on a composite material**

### **Supervisors:**

J.-M. Guimard (EADS) and F. Hild (LMT)

Email: jean-mathieu.guimard@eads.net – hild@lmt.ens-cachan.fr

**Number of students: 2, or 3 at most**

### **Background:**

The generalized use of composite materials in the aeronautics industry requires robust design tools. To optimize structures in terms of cost, mass and performance asks for a better knowledge on the mechanical behavior of the materials used to make them. Industry and Universities aim at developing constitutive models whose predictions should be as reliable as possible. Once these models are validated, they will be used to design new structures.



Virtual view of the next Airbus A350

The present project is part of the general framework presented above. More precisely it deals with the identification of cracking parameters of a composite material used in the aeronautics industry.

### **Objectives:**

The identification of parameters related to a fracture model needs experimental and numerical tools to be used. On the experimental side, data are extracted from mechanical tests (e.g., displacement fields, forces). The latter ones are compared with numerical simulations to determine material

parameters that minimize the distance between measured and computed quantities. In practice, a tensile test on a cracked sample is monitored by resorting to digital image correlation (DIC) to follow crack initiation and crack propagation. It allows displacement fields to be measured, and subsequently compared with numerical simulations in which experimental boundary conditions are considered.



Example of a cracking test on a composite material

**Schedule:**

- Analysis of the problem to solve (at EADS-IW)
- Bibliographic analyses associated with DIC and composite materials
- Mechanical test on cracked samples made of composite materials
- Kinematic measurements using DIC
- Finite element analyses of the tests and identification of cracking parameters

**Documents and tools:**

- Course on DIC and on composite materials
- MSc report on subjects closely related to the present project
- CorreliQ4code

**Partners:**

Engineers at the research center EADS-IW (Suresnes)