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## Spring-back simulation of unidirectional carbon/epoxy flat laminate composite manufactured through autoclave process

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**Keywords:** Springback; CFRP; Finite element analysis.

**Abstract.** This paper presents an original method in predicting the spring-back for composite aircraft structures manufactured through autoclave process. It uses explicit Nonlinear Finite Element Analysis. Firstly, the spring-back of unidirectional prepreg lay-up samples of different sizes and thicknesses is analysed from an experimental point of view. Then, a numerical model which takes into accounts the physical mechanism of spring-back such as ply stretching and tool-laminate interface properties is detailed. The comparative study between the experimental data and numerical results show that the simulation predicts adequately the spring-back deformation within the range of dimension and thickness of specimen tested during this work. The simulations validate the out of plane shear stress distribution of interface and through thickness in plane normal stress gradient of laminate.

### 1- Introduction

The manufacturing of carbon fibre reinforced polymer (CFRP) induces permanent deformation, also called spring-back, after curing cycle using autoclave manufacturing process. Such deviations from the designed shape will lead to high scrap rates and therefore increases manufacturing cost and delay the delivery. Given the high manufacturing rates required by modern aircrafts, more efficient

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