Today, the aeronautics industry faces a major challenge: it must combine a high production rate with a reduction of cost production while maintaining a high level of product technicality (mechanical performance and lightness). It requires process innovations that must lead to a low scrap rate and an ability to identify them early in the process.

Stamping of thermoplastic composites coupled with overmolding is one of the best processes to combine speed and reliability of the product and is then subject of interest of such industry. Indeed, the stamping step is very fast while the overmolding step allows the production of much more complex part by adding new functions without adding assembly operations.

Meanwhile, as this process is composed of successive steps, each of them generates specific defects.

Firstly, during stamping operation the typical defects occurring are mainly either porosities or wrinkles. Porosities are involved by a lack of pressure during the stamping step leading to a bad impregnation of the fibers by the resin. The wrinkles can be induced by mistakes in the positioning of the material in the mold or by the process itself.

Secondly, during the overmolding step, the polymer is expected to adhere to the stamped part. However, depending on the process conditions (low injection temperature or low pressure) adhesion may not occurs. In the same time, porosities in the overmolded part could also appear depending of the injection conditions.

Today, ultrasonic methods is considered as the reference NDT method. nevertheless, online ultrasonic measurement remains complicated. They require a long implementation time due to the sweeping allowing covering the entire surface to be investigated. In parallel, active thermography which is a full field could significantly reduce measurement times but its performance has to be demonstrated. From an industrial point of view, the performance criteria are not only the probability of detection (POD) but also the duration of a measurement and its ability to be introduced into the industrial tool.

Hence, the aim of this work is to investigate the capacity of thermography, ultrasonic phased array and Laser ultrasound NDT method to identify and differentiate the different defects occurring in an overmoulding process. The ability to these NDT method to be introduced in an industrial tool will also be discussed.

Keywords: Stamping-overmolding process | Composite material | Ultrasonic phased array | Thermography | Laser ultrasound |