

ABSTRACT

Aircraft repair, as well as production and operation, requires quality control. This control takes place in several stages, covering various aspects. Starting from supervision over the authorizations of persons performing the work, through the creation of records that allow to recreate the work flow and supervision of the materials used for work, to visual verification and non-destructive testing. A special role can be assigned to non-destructive testing, due to a non-invasive assessment of the technical condition of inseparably joined elements. They are also a tool for assessing the technical condition of the repair area during further aircraft operation.

The Work concerns the assessment of the possibility of using the shearography method to test the quality of aircraft metal sandwich structures repairs. In the first part of the work, based on the literature, the metal sandwich structures were characterized in terms of their construction and operation. The causes and types of damage were indicated. Scenarios of how to proceed with the damaged structure and the types of repairs that could be applied were discussed. The methods of non-destructive testing used in the diagnosis of sandwich structures for repairs were also presented, placing them in the context of assessing the quality of repairs. Particular emphasis was placed on the description of the shearography method that was used in the research part of the work. Currently used approach to bonded repair inspection are described and their limitations are indicated. This allowed to determine the purpose of the work, which was to develop a methodology for assessing the quality of repairs of metal sandwich structures using the method of shearography. This methodology allows for the assessment of repair quality using a single test method, thus simplifying the quality control process. Proposed approach reduces the number of competency requirements for personnel and also the number of activities necessary within the broadly understood quality control of the repair process.

Based on the performed research program, the possibility of detecting the expected types of damage was confirmed and a methodology for assessing the quality of repairs was developed. The final part of the work consist the verification of the developed solution on a real object by comparing the results of the shearography method with the results obtained using other (reference) non-destructive testing methods.

Keywords: Non-destructive testing, diagnostic methods, sandwich structures, repairs, aircraft operation