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The deformation and residual stress simulation of dual laser-beam bilateral synchronous welding for Al-alloy aircraft panel structure

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ABSTRACT

This paper reports a numerical investigation of dual laser-beam bilateral synchronous welding (DLBSW) for T-joint structure of aircraft fuselage. Finite element numerical simulation of DLBSW is carried out to obtain suitable matching of welding parameters for civil aircraft panels that is composed of 6156 aluminum alloy skin and 6056 aluminum alloy stringer. The distribution of welding residual stress and welding distortion on the aircraft panels are predicted and discussed. Three-dimensional finite element model of the panel containing three stringers has been developed to simulate the temperature field, residual stress distribution, and welded panel distortion. It is simulated that three stringers are welded to base plate of the specimen through different welding sequences and the welding sequence with the smallest distortion is acquired.

KEYWORDS: DLBSW, welding simulation, aluminum alloy, aircraft panel