

Description of the method for obtaining similarity of the structure stiffness on the example of building a dynamically scaled model of the wings of a light aircraft

MILCZARCZYK Jarosław ^{1*}, ROGÓLSKI Robert ² and OLEJNIK Aleksander ³.

¹Faculty of Mechatronics, Armament and Aerospace, Military University of Technology, ul. gen. Sylwestra Kaliskiego 2, 00-908, Warsaw, Poland; e-mail: jaroslaw.milczarczyk@wat.edu.pl

²Faculty of Mechatronics, Armament and Aerospace, Military University of Technology, ul. gen. Sylwestra Kaliskiego 2, 00-908, Warsaw, Poland; e-mail: robert.rogolski@wat.edu.pl

³Faculty of Mechatronics, Armament and Aerospace, Military University of Technology, ul. gen. Sylwestra Kaliskiego 2, 00-908, Warsaw, Poland; e-mail: aleksander.olejnik@wat.edu.pl

* Correspondence: jaroslaw.milczarczyk@wat.edu.pl; Tel.: +48 261 83 97 32

Keywords: aerospace, dynamically scaled models, aircraft scaling, stiffness scaling, aircraft modeling, composites properties

Abstract. The fundamental requirement for building scaled models of newly designed aircraft to study their flight characteristics is achieving dynamic similarity [1, 2], resulting from scaling dimensions and masses. An additional requirement is ensuring similarity in structural stiffness. This paper presents a method for achieving scaling the stiffness of wing structures. Using a dynamically scaled model of a real aircraft as an example, the determination of conditions for similarity in wing structure stiffness is discussed. This paper further explores issues related to torsional stiffness during the design, construction, and validation stages. This is an example of leveraging the advantages of composite technologies to design structures with the required properties. The scaled model is a composite structure, while the reference aircraft is made of metal. All structures and tests were conducted as part of research and development projects at the Faculty of Mechatronics, Armament, and Aviation of the Military University of Technology.