A method of integrating design information in the aircraft preliminary design process

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Abstract. When designing light aircraft, the designer should take into account many different factors from various fields, such as aerodynamics, structural strength, flight mechanics, etc., from the conception stage. To perform advanced analyzes during development and optimisation work, it is usually necessary to quickly generate an aircraft model in the CAD environment. Such a primary geometric form is the input model for further analyses. The paper presents a method of quick generation of the CAD model including the conceptual form of the aircraft. The model is created on the basis of previously identified assumptions and construction rules used in the design of aircraft. The rules are based on integrated information from the fields of aircraft design, aerodynamics, and flight mechanics, as well as good engineering practises and aviation regulations. The structure of the information and the way of its integration into the CAD model were presented. Generative modelling is used to generate the CAD model. The model also includes strength verification algorithms, which are commonly used in conceptual design. The geometric model is based on a hierarchical structure adapted for reuse. The structure of the model is simplified for the purposes of preliminary model generation, but has the potential for further extensive development and refinement. This basic geometry can be used for further development and refinement. The paper also presents the verification of the method on the example of ready-made commercial aircraft and glider structures, starting from classic structures and ending with structures with the best performance used in air sports.

Keywords. Generative model, information integration, aircraft design, design automation, CAD model reusibility

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