

## Validation Study of Radial Aircraft Engine Model

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**Abstract :** This paper presents the radial aircraft engine model which has been created in AVL Boost software. This model is a one-dimensional physical model of the engine, which enables us to investigate the impact of an ignition system design on engine performance (power, torque, fuel consumption). In addition, this model allows research under variable environmental conditions to reflect varied flight conditions (altitude, humidity, cruising speed). Before the simulation research the identifying parameters and validating of model were studied. In order to verify the feasibility to take off power of gasoline radial aircraft engine model, some validation study was carried out. The first stage of the identification was completed with reference to the technical documentation provided by manufacturer of engine and the experiments on the test stand of the real engine. The second stage involved a comparison of simulation results with the results of the engine stand tests performed on a WSK 'PZL-Kalisz'. The engine was loaded by a propeller in a special test bench. Identifying the model parameters referred to a comparison of the test results to the simulation in terms of: pressure behind the throttles, pressure in the inlet pipe, and time course for pressure in the first inlet pipe, power, and specific fuel consumption. Accordingly, the required coefficients and error of simulation calculation relative to the real-object experiments were determined. Obtained the time course for pressure and its value is compatible with the experimental results. Additionally the engine power and specific fuel consumption tends to be significantly compatible with the bench tests. The mapping error does not exceed 1.5%, which verifies positively the model of combustion and allows us to predict engine performance if the process of combustion will be modified. The next conducted tests verified completely model. The maximum mapping error for the pressure behind the throttles and the inlet pipe pressure is 4 %, which proves the model of the inlet duct in the engine with the charging compressor to be correct.

**Keywords :** 1D-model, aircraft engine, performance, validation

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