

Modeling of Combustion Process in the Piston Aircraft Engine Using a MCFM-3Z Model

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Abstract : Modeling of a combustion process in a 9-cylinder aircraft engine is presented. The simulations of the combustion process in the IC engine have provided the information on the spatial and time distributions of selected quantities within the combustion chamber of the engine. The numerical analysis results have been compared with the results of indication process of the engine on the test stand. Modeling of combustion process an auto-ignited IC engine in the AVL Fire was carried out within the study. For the calculations, a ECFM-3Z model was used. Verification of simulation results was carried out by comparison of the pressure in the cylinder. The courses of indicated pressure, obtained from the simulations and during the engine tests mounted on a test stand were compared. The engine was braked by the propeller, which results in an adequate external power characteristics. The test object is a modified ASz-62IR engine with the injection system. The engine was running at take-off power. To check the optimum ignition timing regarding power, calculations, tests were performed for 7 different moments of ignition. The analyses of temperature distribution in the cylinder depending on the moments of ignition were carried out. Additional the course of pressure in the cylinder at different angles of ignition delays of the second spark plug were examined. The swirling of the mixture in the combustion chamber was also analysed. It has been shown that the largest vortexes occur in the middle of the chamber, and gets smaller, closer to the combustion chamber walls. This work has been financed by the Polish National Centre for Research and Development, INNOLOT, under Grant Agreement No. INNOLOT/I/1/NCBR/2013.

Keywords : CFD, combustion, internal combustion engine, aircraft engine

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