

A Second Spark Ignition Timing for the High Power Aircraft Radial Engine Using a CFD Transient Modeling

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Abstract : In aviation most important systems that impact the aircraft flight safety are duplicated. The ASz-62IR aircraft radial engine consists of two spark plugs powered by two separate magnetos. The relative difference in spark timing has an influence on the combustion process. The retardation of the second spark relative to the first spark was analyzed. The CFD simulation was developed as a multicycle transient model. Two independent spark sources imitate two flame fronts after an ignition period. It makes the combustion process shorter but only for certain range of second spark retardation. The model was validated by the in-cylinder pressure comparison. Combustion parameters were analyzed for different second spark retardation values. It was found that the most advantageous ignition timing in means of performance is simultaneous ignition. Nevertheless, for this engine the ignition time of the second spark plug is greatly retarded eliminating the advantageous performance influence. The reason behind this is maintaining high ignition certainty for all engine running conditions and for whole operating rpm range. In aviation the engine reliability is more important than its performance. Introducing electronic ignition system can yield from simultaneous ignition timing by increasing the engine performance and providing good reliability for all flight conditions. 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, ignition, simulation, timing

Conference Title : ICFMTE 2016 : International Conference on Fluid Mechanics and Thermal Engineering

Conference Location : San Francisco, United States

Conference Dates : September 26-27, 2016