

Experimental study on the effect of water injection on a micro turbojet engine

Due to increasing emissions in the 21st century, aviation industry faces a rising pressure to reduce its contribution to air pollution. A possible way to mitigate such harmful effects on the environment is to use water injection as a thrust augmentation method which was developed in the 1960s. Since the emergence of modern engines, the need for the performance-enhancing effect of water injection has become abandoned. However, considering its beneficial impact on both emissions and engine structure, it can still be used as an alternative nowadays as well. As a result of the cooling effect of water injection, the service life of engine components extends which could also lead to a reduction in maintenance and operating costs. This paper presents how water injection on TKT-1 experimental jet engine affects performance and emissions. The modifications implemented on the test bench enabled us to obtain a measure of the water injection operation with the nozzle placed in the intake duct. Results reveal that such method has no visible impact on the increase of thrust due to the experimental environmental conditions and the limitations of the system. Nevertheless, water injection proved to be effective in reducing emissions. In addition to the beneficial effect of lower gas temperature throughout the turbine section of the engine, the emissions of NO_x gases also fall significantly (i.e. 30%) compared to dry operation.

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