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APPLICATION OF AEROSPIKE TO HYPERSONIC VEHICLE: THE SCIENTIFIC FLIGHT TEST  
OF CHINA'S FIRST COMMERCIAL ROCKET

**Abstract**

The successful launch of Space-X Falcon Heavy rocket indicates the competition of commercial space-industry is becoming more and more intense all over the world. In China, dozens of commercial aerospace enterprises have engaged and responded to the Chinese government policy, “military and civilian integration”, to satisfy the requirement of aerospace industrialization. China has already accumulated decades of space technology. It is time for China to develop and enlarge the commercial aerospace market. OneSpace Science and Technology CO. Ltd. (OneSpace) which is the largest commercial aerospace enterprise in China will launch the first commercial rocket OS-X0 in May 2018. The main goal of the OS-X series rockets is to provide a low-cost and high-efficiency platform for the performance testing of hypersonic vehicle to gather fundamental scientific data which is difficult or impossible to obtain via ground testing alone. For OS-X0, OneSpace independently designed a solid rocket engine named XGF which was successfully tested and run in December 22, 2017. The diameter of the engine is 850 mm, the total weight is 5233 kg, the rated average thrust is 300 kN, and the working time is 37 seconds. The maximum trajectory height of OS-X0 is 40 km, and the maximum Mach number is larger than 6. The payload is composed of a universal hypersonic vehicle head with an aerospike. The purpose is to investigate the performance of passive flow-control of the aerospike in hypersonic flow. As the drag reduction effect of aerospike in the supersonic flow has been verified in flight tests abroad, the aerospike of OS-X0 could achieve maximum drag reduction of 35 percent for the head in hypersonic flow. The scientific research of OS-X0 focuses on heat flux reduction and sonic-boom mitigation. The ground prediction results showed that the aerospike could achieve maximum heat flux reduction of 51 percent for the head in hypersonic flow, which will greatly improve the flight performance of hypersonic vehicle because of a good thermal environment. By studying the effect of aerospike on sonic-boom mitigation, it can be advantageous to support the engineering application of future hypersonic aircraft, breaking through the key technologies, improving commercialization and developing core technology for long-range high-speed aircraft.