

SPACE PROPULSION SYMPOSIUM (C4)  
Propulsion Technology (3)

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INVESTIGATION ON THE KEY TECHNOLOGIES OF MODERN LIQUID ROCKET ENGINE

**Abstract**

Higher performance, higher reliability, lower cost and easier maintenance are the basic requirements for the modern liquid rocket engine. The key technologies involving system design, subassembly design, general assemble technology, and, utilization of new material and advanced manufacturing technology of the liquid propellant rocket engine are discussed systemically in the present paper. Rocket engine system design technologies include system project design and optimization, engine starting process simulation, wide range thrust and mixture ratio regulation, health detection and fault diagnosis technology. System project is the most important one because it determines many key characteristics of the rocket engine such as technical difficulties, cost, reliability, performance and maintenance. Therefore, main issues concerning the design and optimization of the system projects are presented in details. Subassembly design technologies mainly consist of thrust chamber design and turbopump design. The thrust chamber design demands the researches of high performance injector, combustion chamber work process analysis, and reliable long life cooling technology. While the turbopump design needs the structure design and simulation, hydrostatic and hydrodynamic bearing, and, high efficiency axial force balance technology. The development and critical points of these aspects are reviewed. General assembly involves some important technologies such as metal seal, thrust vector control, fault detection and health maintenance. The main problems of the metal seal are put forward. The developing directions of thrust liquid engine are listed. The methods of fault detection and health maintenance are discussed. Application of new material and advanced manufacturing technology in the modern rocket engine are very natural with the development of modern science and technology. Several new materials and manufacturing technology adopted in the rocket engine are introduced. The trend of the new materials is given. It is concluded that the exist achievements and experiences, manufacturing and test ability, and the developing of new technologies must be paid extensive attentions in the design of modern rocket engine. The modern computer and numerical analysis can be an important means to assist the development of these key technologies.