## SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2) Launch Services, Missions, Operations, and Facilities (2)

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## THE COMPLETELY REDUNDANT DESIGN OF THE TEST LAUNCH CONTROL SYSTEM FOR MANNED RENDEZVOUS AND DOCKING LAUNCH VEHICLE

## Abstract

The "zero window" feature of the manned rendezvous and docking mission demanded rocket launch should ensure success and safety, and it also demanded the test launch control system should aim at high reliability and high security. But the traditional system scheme had been unable to meet the requirements of manned space mission in the new period. So the integrative and completely redundant test launch control system arose at the historic moment. On basis of mature design, this new design had taken full advantage of system integration and implemented the completely redundant design in the aspects of types, flows, launch-control and measurements. As a result the launching reliability had reached a level up to 0.991. Meanwhile the systematic performance on test completeness and troubleshooting had improved significantly. Compared with several mainstream models of launch vehicle, the design of the test launch control system for manned rendezvous and docking mission had the following outstanding characteristics: a) NSPF(No Single Point of Failure) launch process, which ensured on time launch; b) different-constructed redundant launch control system, which eliminated common cause failures; c) directly connected emergency channel, which reduced intermediate links and control. From 2011 till now, the integrative and completely redundant test launch control system has successfully launched Tiangong-1, Shenzhou-8, Shenzhou-9 and Shenzhou-10, precisely achieved the "zero window" launch for docking mission, fully validated the correctness and effectiveness of the system design, and powerfully provided dependable safeguard for manned rendezvous and docking.