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DEVELOPMENT AND PROSPECT OF LAUNCH VEHICLE GROUND TESTING TECHNOLOGY

Abstract

As world space launch activities have entered an intensive stage, how to effectively improve efficiency, reduce costs, and enhance the ability to go into space while ensuring reliability and safety has become an important factor in measuring space capabilities. The launch vehicle must fly reliably and stably, and send the satellite into the predetermined orbit accurately. Not only is the important role of the systems on the vehicle, but ground testing and launch control also play a vital role in ensuring the success of the launch vehicle mission. The emergence of COVID-19 in early 2020 also challenged the personnel-intensive industrial model. Intelligent, unmanned, efficient, and system will be the dominant model in the future. This paper reviews the development status of the world's launch vehicle test launch technology, analyzes the capabilities and shortcomings of existing test launch technology, and proposes the development trend of future launch vehicle test launch technology based on new technologies emerging from the new round of scientific and technological revolution. The outlook for next-generation test launch system is also presented. Future test launch technologies will highlight the three characteristics of digitalization, networking and intelligence. Digitization lays the foundation for test launch informationization. Its development trend is big data analysis and application, replacing the existing software tools to extract, store, search, share, analyze, and process massive and complex data sets to achieve depth test launch data mining and maximum value. Networking provides a physical carrier for information dissemination. Its development trend is the adoption of information physical systems (CPS), integrated computing, communication, and control. Through networking, ground test transmitting equipment has computing, communication, precise control, remote coordination, autonomy and other functions. Intelligence reflects the level of information application. Its development trend is a new generation of artificial intelligence. According to the requirements of vehicle launch, it could quickly generate data and upload binding. Through intelligent detection methods, it could complete the required operations, inspections and tests before launching, and achieve autonomous vehicle launching. In the future, intelligent cyber-physical fusion system based on big data will become the mainstream direction of rocket vehicle test launch technology, which will further simplify operations, improve efficiency, reduce costs, and achieve the goal of "launch during transport ".