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CURRENT STATUS AND EMERGING TRENDS IN LAUNCH VEHICLE TECHNOLOGY: A COMPREHENSIVE REVIEW OF OPERATIONAL AND SHORT-TERM DEVELOPMENT VEHICLES

Abstract

This review presents an up-to-date overview of the current status of launch vehicles that are currently in use around the world, as well as those that are under short-term development. The main goal is to present a thorough evaluation of the state-of-the-art in launch vehicle technology, taking into account their performance capabilities, design features, and operational requirements.

The review begins by giving a general overview of the various launch vehicle types now in use, including disposable and reusable launch vehicles, as well as an analysis of their benefits and drawbacks. The article goes on to discuss the main launch vehicle families that are currently in use, including the Proton, Soyuz, and Angara rockets from Russia, the Ariane, Vega, and Soyuz-ST rockets from Europe, the Atlas V, Delta IV, and Falcon 9 rockets from America, and the Long March and CZ-5 rockets from China.

The article also discusses new trends and technological advancements in the field of launch vehicles, such as the growing emphasis on reusable launch vehicles and the emergence of commercial space firms. This covers an examination of the development of businesses like SpaceX, Blue Origin, and Virgin Galactic, as well as a discussion of their individual ambitions for launching commercial payloads and space travellers.

The evaluation also identifies the difficulties faced by launch vehicle operators, including the growing requirement to launch bigger and more complicated payloads, the need for increased safety and reliability, and the effects of geopolitical tensions on the global launch business. The article also looks at the initiatives being taken to deal with these issues, including the creation of new propulsion systems, the use of cutting-edge materials, and the deployment of improved launch vehicle management systems.

The review culminates with a summary of the major conclusions and revelations gleaned from the research, as well as a look ahead at launch vehicle technology. In the upcoming years, it is anticipated that launch vehicle technology will continue to advance quickly with an increased emphasis on accessibility, sustainability, and adaptability. In particular, it is anticipated that this industry will experience tremendous innovation and expansion as a result of new launch vehicle designs and propulsion technologies, as well as the expanding commercialization of the space business