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A NEW APPROACH OF SMALL LAUNCHER SYSTEM BASED ON STRATOSPHERIC FLOATING
COMPLEX

Abstract

One of the main tasks of developing aerospace launching vehicle is to lower the cost. DAPAR, for instance, has targeted to deliver the payload of 45kg into LEO within 1 million \$. Confronting the prosperity of small-scale satellite launching missions, it is quite necessary to develop the corresponding small launcher system while saving the cost. Numerous novel ideas and measurements have been undertaken, still, they suffer from tremendous technical risk, huge earlier stage investment and long return cycle. Initialized from the cost structure analysis of launching vehicle and grounded on the principles of reusability, inheritance and simplicity, an innovative and economic approach of small launcher system based on floating complex in stratosphere is proposed.

Taking the advantage of stratospheric environment, the small solid rocket is carried by a floating complex to the height of 20-22km and then disengaged. Subsequently, the rocket ignites and continues the post flight after an adequate departure between itself and the complex, and the latter returns to the ground for the next mission. The complex is designed as the combination of modularized helium balloons, each of which has the radius of tens of meters, so the complex can be simply enlarged to provide more floating capability if needed. A spreadsheet calculation reveals that under the state of the art of related technology, such a complex is able to deliver a small solid rocket of about 20 tons, such as PEGASUS and SCOUT, to the stratosphere, and in such way the payload capacity can be increased by 20%.

This approach derives from relatively mature techniques thus maintains high inheritance and simplicity. The rocket, benefited from the comparatively friendly environment, can be easily designed and manufactured with desirable safety margin. The complex, as a movable, reconfigurable and partially reusable platform, can also present deployment flexibility, mission adaptability and, most importantly, low cost. From the economic point of view, the launching cost for payload is expected to be limited to 15,000\$ per kilogram.