

33.3: Staging

In practice, it is found that it can be more efficient to launch rockets in stages, where part of the rocket structure drops away when it is no longer needed, thus decreasing the amount of mass that needs to be placed in orbit. For example, the Saturn V rocket had three stages. The large lower first stage contained a large fuel tank and large engines. When all the fuel contained in that stage had been spent, the entire first stage separated and dropped away, and a smaller second stage was ignited. When all the second-stage fuel was spent, it too separated and dropped away, and the third stage engine ignited, which placed the spacecraft into Earth orbit. This staged approach requires much less fuel than launching the entire Saturn V rocket into orbit.

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