WE CLAIM:

1. A modular configuration of a launch vehicle system, comprising,

a core booster, and a plurality of strapon boosters, wherein the plurality of strapon boosters are configured to attach with the core booster, wherein the number of strapon boosters selectable and ranges from 1 to 6, wherein the core booster and each of the plurality of strapon boosters comprises an engine cluster, wherein each engine cluster comprises two or more engines, wherein the number of engines in each engine cluster ranging from 2 to 7, wherein the engine clusters are placed in a predetermined configuration in the core booster, and in the plurality of strapon boosters, wherein the launch vehicle system comprises a plurality of vehicle stages comprising a first stage comprising the core booster and the plurality of strapon boosters, and a second/upper stage to carry a payload (200) to an orbital trajectory; and engine control hardware for launching and removing one or more engines;

wherein the launch vehicle system is dynamically configured by (i) selectively adding or removing one or more engines in at least one of the core booster, or the plurality of strapon boosters based on the payload to be launched, (ii) changing the number of stages in the plurality of vehicle stages by adding or removing one or more stages of the launch vehicle system according to the payload mass to be launched, and (iii) optimizing sub-system level components comprising plumbing lines, computers, and electronic hardware, to reduce the mass of unused system components, and the engine cluster exhibits one or more combinations depending on the payload mass to perform trajectory manoeuvres of the launch vehicle system to reach the orbit with the least amount of energy.

2. The modular configuration of the launch vehicle system as claimed in claim 1, wherein the engine clusters configuration involves removing one or more engines according to the particular mission, keeping other system level and sub-system level components intact.

3. The modular configuration of the launch vehicle system as claimed in claim 1, wherein the plurality of vehicle stages comprises a plurality of additional upper stages and wherein the first stage of the launch vehicle system is added as side boosters.

4. The modular configuration of the launch vehicle system as claimed in claim 1, wherein the launch vehicle system consists of a maximum of 49 engines in the booster stage.

5. The modular configuration of the launch vehicle system as claimed in claim 1, wherein the engine control hardware consists of two modules that perform all the engine functions such as ignition, shutdown, mixture ratio control and thrust vector control for gimbaling.

6. The modular configuration of the launch vehicle system as claimed in claim 1, wherein the electronic hardware is specific for an engine, which results in no redundant hardware left on the vehicle when a particular engine is removed.