

Reusable NASA Space Launch System Using SpaceX Merlin 1D and Draco Engines

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Addition of a Merlin 1D in the center position of the Space Launch System SSME cluster, and four Super Draco engines between the SSMEs - yields a stable terminal SLS braking and landing system.

Four Super Draco engines along with a complete suite of Dragon style Draco orbital maneuvering thrusters mounted fore and aft will allow for high precision SLS orbital, reentry and landing operations.

Indeed, four Super Draco thrusters alone would be sufficient to land most common ELV booster cores, and would be more than sufficient for all in space maneuvering of single stage to orbit hydrogen cores.

A launch vehicle equivalent of a dead stick landing would be the automated precision terminal landing upon fuel exhaustion of a ballistically reentering first stage - in either the vertical or horizontal position. Any remaining residual hypergolic fuels may then be simply burned off on the landing pad for safety.

One can now envision a modern fully reusable heavy lift launch vehicle utilizing four separate fuels - solid rocket boosters for off the pad payload efficacy, reusable hydrocarbon boosters for first stages, hydrogen for deep space payload delivery and hypergolics (or alternatives) for in space maneuvering.

Combined with solar powered high Isp thrusters and other passive means of three axis stabilization, and two stage to orbit horizontally launched hydrogen powered space planes for human transportation, this basic technique can and will provide a robust framework for all future space development needs.