Light-Gas Launch Vehicle for Atmospheric Sampling

Abstract

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Green Launch will deploy a novel, zero-carbon emission vehicle that will enable atmospheric sample collection in the mesosphere. This is a proof-of-concept for a clean, inexpensive, and efficient vehicle sampler capable of atmospheric exploration well beyond the current altitude limit of conventional balloons (30 km). Further, this vehicle technology and platform will facilitate direct sampling of the upper atmosphere on a cadence that is currently economically and environmentally infeasible with sounding rockets. The mesosphere is of particular interest since it has great bearing on the earth's energy budget and physical data from this layer is valuable for climate scientists around the world.

Our launch system is based on one built at Lawrence Livermore National Laboratory by C.T.O. Dr John Hunter. John and his team, designed, assembled and operated the world's largest hydrogen launcher, SHARP. This system, launched hypersonic vehicles at world record speeds and was used to test SCRAM jets.

Light-gases can be captured and re-used indefinitely, unlike rocket propellant. This recapture after each launch reduces the amount of additional vehicle propellant required for successive launches to near zero.

Vehicle emissions and debris from deorbiting spacecraft are having effects on global atmospheric chemistry. Through improved monitoring and regulation we can create an environmentally sustainable space industry.

The Green Launch disruptive technology is cheaper and more flexible than conventional suborbital vehicles. It is also more environmentally friendly since it produces zero hydrocarbons. We do not have significant physical limitations in reaching our velocity requirements. The record for a projectile launched with hydrogen propellant is 11.2km/sec. We plan to limit our launch velocity to 6 km/sec to extend reusability and prevent wear on the barrel.

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200 cc sample volume with Ra 10 finish

Avionics with controller + battery

1/8" VCR female nut with hollow male plug

Solenoid valve

Nose ejection system with streamer