

What's New About Scorpius?

J. Wertz, 11/15/06

The Scorpius program has made enormous strides in furthering the objectives of dramatically lower cost, more responsive launch systems. Here is a short summary of the most important major accomplishments and "new achievements" for Scorpius. Comments and questions are always welcome and can be sent to me at jwertz@smad.com.

Jim Wertz

Lowest cost and cost/lb launch vehicle ever designed for realistic launch rates

Sprite can put 1050 lbs into low Earth orbit for \$4.2 million at a rate 3-4 launches/year

Exodus can put >16,000 into low Earth orbit for \$14 million, i.e., less than \$1,000/lb to LEO

Cost model based on real costs and validated by both Galorath Corp. and NASA MSFC Cost Analysis Group

As the Sprite design has matured, performance has gone up by 50% while projected costs have remained fixed

Truly Responsive Launch

Beat DARPA's objectives on the FALCON program by a factor of 10

Demonstrated ability to launch from a flat pad in less than 8 hours (suborbital demonstration from an undeveloped site)

Included use of small contractor crew to eliminate the "standing army" approach to launch operations

Historically, the major technical impediment to a responsive launch is winds aloft

Sprite can launch through over 99.9% of winds aloft

Can lift off in over 100 kt ground winds (Category 3 hurricane)

Lowest cost launch vehicle rocket engine ever built

5K lbf engine for \$15,000

3 flown successfully on suborbital flights

20K lbf engine for \$65,000 (cost)

Compares to price of \$12M to \$16M for current production 20K lbf RL-10 engine (cost may well be less)

Performance exceeds design projections

Initial design for 80K lbf engine

First ever all-composite cryogenic LOX tank

Does not leak from microcracking

Full-scale tank tested to over 2100 psi, nearly 4 times required operating pressure of 550 psi (came within 3.5% of predicted burst pressure)

Strong enough that unpressurized LOX tank can support the weight of a pick-up truck and 4 people with no detectable bending

Allows 30% increase in vehicle performance to orbit at no increase in cost

Received the American Composites Manufacturers Association (ACMA) and *Composites Manufacturing* magazine 2006 Award for Excellence and Innovation in Composites Engineering

Flew first ever all-composite LOX tank on a Garvey rocket in June, 2000

First ever successful Tridyne pressurization system for launch vehicles

Reduces the mass of the launch vehicle pressurization system by a factor of 2 with essentially no increase in cost

Allows pressure-fed systems to be scalable to any size launch vehicle

Design for manufacturability and scalability

7 nearly identical pods in each vehicle allows economies of scale even when built at a rate 2-3 per year

Low-cost composite design with no vacuum-bagging or autoclave cure

Developed a transition plan to go from a single demo flight to a low-cost, responsive operational system

Fully scalable design such that technology can be developed on smaller, low-cost vehicles