## SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2) Launch Vehicles in Service or in Development (1)

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## SPACEX FALCON 9 MAIDEN FLIGHT RESULTS AND FUTURE DEVELOPMENTS

## Abstract

The Falcon 9 launch vehicle builds on the technologies and expertise developed during the design, assembly and commercial deployment of the Falcon 1 and will provide an Evolved Expendable Launch Vehicle (EELV)–class launch capability while attaining significant improvements in reliability, cost and responsiveness over existing vehicles.

With the maiden launch scheduled for Summer 2009 and 18 additional Falcon 9 flights already contracted on the manifest, this medium-heavy lift launch vehicle will be the workhorse of the SpaceX fleet. Capable of carrying 10 metric tons to low Earth orbit and nearly 4500 kg to a 1500 meters-per-second geosynchronous transfer orbit, at a fraction of the cost of its competition, the Falcon 9 will revolutionize access to space. It has already begun to set record as launch vehicle of choice for NASA's cargo resupply of the International Space Station.

Falcon 9 is a two-stage vehicle powered by liquid oxygen and rocket-grade kerosene (RP-1) bipropellant engines. The first stage generates 832,000 pounds force (3,700kN) of thrust (sea-level) using nine Merlin-1C engines and the second stage generates 96,000 pounds force (427 kN) of thrust (vacuum) using a single Merlin-1C Vac engine. The Falcon 9 has engine out capability starting early in the first stage burn. Later during the first stage burn, the Falcon 9 can tolerate additional engines out. The architecture surrounding the development of this vehicle provides a man-rated capability.

Consistent with SpaceX's corporate philosophy of rapid and continuous improvement, Falcon 9 has a planned evolution path which will include significant upgrades based upon experience from previous missions. An overview of the Falcon 9 upgrades and description on how they will positively impact the satellite community are discussed. Furthermore, SpaceX plans to begin its development for a Falcon 9 Heavy – a triple core first stage that will be capable of inserting 30 metric tones to LEO and 15MT to GTO. At roughly 100*M*, this vehicle will provide the world slowest cost perkilogram transportation atroughly US3000 per kg.