SpaceX • COTS Flight 1
Press Kit

Contents

Media Contact:

Kirstin Brost
Director of Communications, SpaceX
media@SpaceX.com
202-649-2716
SpaceX.com

"When Dragon returns, whether on this mission or a future one, it will herald the dawn of an incredibly exciting new era in space travel. This will be the first new American human capable spacecraft to travel to orbit and back since the Space Shuttle took flight three decades ago. The success of the NASA COTS/CRS program shows that it is possible to return to the fast pace of progress that took place during the Apollo era, but using only a tiny fraction of the resources. If COTS/CRS continues to achieve the milestones that many considered impossible, thanks in large part to the skill of the program management team at NASA, it should be recognized as one of the most effective public-private partnerships in history." Elon Musk, SpaceX CEO & CTO

Launch Schedule

The first demo flight for the Commercial Orbital Transportation Services (COTS) program could happen no earlier than Wednesday December 8th. Watch for updates.

This is the first-ever test flight of a Dragon spacecraft, an entirely new spacecraft designed in the last decade, and only the second ever test flight of the Falcon 9 launch vehicle. It also marks the first time a commercial company is attempting to re-enter a spacecraft from orbit.

On the December 8th, the launch window opens at 9:03 AM EST / 6:03 AM PST / 15:03 UTC and closes at 12:20 PM EST / 9:20 PST / 18:20 UTC

Webcast Information

The COTS Demo 1 launch will be webcast live, with commentary from SpaceX corporate headquarters in Hawthorne, California. The webcast will be available via a link at the SpaceX web site: SpaceX.com

The webcast will begin approximately 45 minutes prior to the opening of the daily launch window, at 8:15 a.m. EST / 5:15 a.m. PST / 13:15 UTC.

During the webcast, SpaceX hosts will provide information specific to the flight, an overview of the Falcon 9 rocket and Dragon spacecraft, and commentary on the launch and flight sequences.

A play-by-play of countdown events will be posted on the bottom of the webcast page, should you encounter any problems viewing these updates you can also see them by visiting www.twitter.com/spacexmissions. You do not need a twitter account to view this webpage.

High-Resolution Photo and Video Content

- Images and video content will be available at: https://send.spacex.com/bds/Login.do?id=A043517252&p1=naj20dpsbfegcidgdlgffcj20
- Additionally, content from all SpaceX flights, including selected high-resolution photos can be downloaded directly from the SpaceX website: SpaceX.com/photo_gallery.php and SpaceX.com/multimedia/videos.php

More Resources on the Web:

- General information, as well as links to photographs will appear at www.twitter.com/spacexer or
- www.facebook.com/spacex.
- For NASA coverage as well as information on the launch visit: http://www.nasa.gov/cots or http://www.nasa.gov/ntv.

NASAfacts

Commercial Crew and Cargo Program
Commercial Orbital Transportation Services
Overview

Through a revolutionary program begun in 2006, NASA's Commercial Crew and Cargo Program is investing financial and technical resources to stimulate efforts within the private sector to develop and demonstrate safe, reliable, and cost-effective space transportation capabilities. In a multiphase strategy, the program is helping spur the innovation and development of new spacecraft and launch vehicles from the commercial industry, creating a new way of delivering cargo – and possibly crew – to low-Earth orbit and the International Space Station.


An artist's depiction of a SpaceX COTS Dragon spacecraft approaching the International Space Station.
SpaceX image

As NASA sets its sights on exploring once again beyond low-Earth orbit, the ability for private industry to take on the task of providing routine access to space and the International Space Station is of vital importance. NASA's Commercial Crew and Cargo Program is the catalyst for this expanding new industry.

The first phase of this strategy is known as Commercial Orbital Transportation Services (COTS). Under COTS, NASA is helping commercial industry develop and demonstrate its own cargo space transportation capabilities to serve the U.S. government and other potential customers. The companies lead and direct their own efforts, with NASA providing technical and financial assistance.

NASA is investing approximately $500 million toward cargo space transportation demonstrations. A unique aspect of the COTS program is that the companies are paid incrementally as they reach certain milestones. This encourages steady progress toward their goals.

COTS was created with four different capabilities that companies could pursue:

- Capability A: External/unpressurized cargo delivery and disposal
- Capability B: Internal/pressurized cargo delivery and disposal
- Capability C: Internal/pressurized cargo delivery and return
- Capability D: Crew transportation (currently not funded)

Two companies have funded COTS agreements with NASA: Space Exploration Technologies (SpaceX) and Orbital Sciences Corporation (Orbital). Since their competitive selection, these two companies have been working vigorously to develop technologies and capabilities to complete orbital space flight demonstrations in 2010 and 2011. The International Space Station Program has already purchased future cargo delivery services from both of these companies to resupply the station through 2015.


An artist's depiction of Orbital's COTS Cygnus spacecraft approaching the International Space Station.
Orbital image

An artist's depiction of Orbital's Taurus II rocket on MARS launch pad.

Orbital Sciences Corporation

Just 100 miles up the coast from where the Wright brothers first flew their airplane at Kitty Hawk, North Carolina, Orbital is planning to launch its new COTS system at the Mid-Atlantic Regional Spaceport (MARS), located at NASA's Wallops Flight Facility in Virginia. Founded in 1982 with the goal of making space technology more affordable, accessible, and useful, Orbital has grown to become a leading developer and manufacturer of space and rocket systems. Its COTS system design is based on the new Taurus II rocket with a liquid oxygen (LOX)/kerosene (RP-1) first stage powered by two Aerojet AJ-26 engines. The Taurus II second stage is ATK's Castor 30 solid propellant motor derived from their flight-proven Castor 120. The spacecraft, known as Cygnus, is derived from Orbital's heritage DAWN and STAR spacecraft projects and International Space Station cargo carriers.

Space Exploration Technologies (SpaceX)

At Florida's Cape Canaveral, within sight of where every NASA human spaceflight mission has launched, SpaceX is planning to launch its new COTS system. Established in 2002, SpaceX is well into the development of a new family of launch vehicles, and has already established an extensive launch manifest. SpaceX is based on the philosophy that simplicity, low cost, and reliability go hand in hand. SpaceX personnel have a rich history of launch vehicle and engine experience, and are developing their Dragon cargo and crew capsule and the Falcon family of rockets from the ground up, including main- and upper-stage engines, cryogenic tank structure, avionics, guidance and control software, and ground support equipment. SpaceX launch vehicles and spacecraft are designed for refurbishment and reuse that, if successful, would make them the world's first fully reusable launch vehicles.

An image of SpaceX Falcon 9 rocket on Pad 40 at Cape Canaveral, Florida.

By the Numbers

Launch Vehicle	Orbital Taurus II	SpaceX Falcon 9
Height	40.1 m	48.1 m
Diameter	3.90 m	3.66 m
Mass at Launch	275,000 kg	313,000 kg
Payload to International Space Station Orbit	5,200 kg	9,800 kg
First Stage		
Thrust	3.45 MN (775,000 lbs)	3.80 MN (854,000 lbs)
Propellant	LOX and RP-1	LOX and RP-1
Second Stage		
Thrust	320 kN (72,000 lbs)	414 kN (93,000 lbs)
Propellant	Solid propellant	LOX and RP-1
Cargo Spacecraft	**Orbital Cygnus**	**SpaceX Dragon**
Height	5.1 m	5.1 m
Diameter	3.05 m	3.66 m
Maximum Pressurized Cargo		
Up Mass / Volume	2,000 kg / 18.75 m^3	3,310 kg / 6.8 m^3
Down Mass / Volume	2,000 kg / 18.75 m^3 Disposed	2,500 kg / 6.8 m^3
Maximum Unpressurized Cargo		
Up Mass / Volume	0	3,310 kg / 14 m^3
Down Mass / Volume	0	2,600 kg / 14 m^3 Disposed

Reflects configurations of the first resupply missions to the International Space Station.

National Aeronautics and Space Administration

Lyndon B. Johnson Space Center
Houston, Texas 77058

www.nasa.gov

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Commercial Orbital Transportation Services (COTS)

This is the first flight under NASA's Commercial Orbital Transportation Services (COTS) program to develop commercial supply services to the International Space Station and encourage the growth of the commercial space industry.

COTS is also an acronym used by government acquisition officials for "commercial off-the -shelf," meaning that the government should, when possible, take advantage of commercially available products of equal quality and utility when doing so is the most cost-effective option.

After the Space Shuttle retires, SpaceX will make at least 12 flights to carry cargo to and from the International Space Station as part of a Commercial Resupply Services (CRS) contract for NASA awarded in 2008. The $1.6 billion contract represents a minimum of 12 flights, with an option to order additional missions for up to $3.1 billion. Only SpaceX has the ability to return cargo from the station.

This has been a strong government-commercial partnership. SpaceX has only come this far by building upon the incredible achievements of NASA, having NASA as an anchor tenant for launch, and receiving expert advice and mentorship throughout the development process.

With the savings NASA will see by using SpaceX for low-Earth transportation, billions of dollars are freed up for other activities such as accelerating exploration efforts that go beyond low-Earth orbit, advanced telescopes and Earth science missions.

The Falcon 9 rocket and Dragon spacecraft were designed to one day carry astronauts; both the COTS and CRS missions will yield valuable flight experience toward this goal.

Mission Facts

- **Inclination:** 34.5 degrees.
- **Orbit:** 300 kilometers circular orbit
- **# Orbits:** Almost 2 nominal, 3 contingency
- **Top Speeds:** Greater than 17,000 mph, allowing Dragon to orbit Earth in 90 min.
- **Time:** Roughly 3 ½ hours from launch to splashdown
- **Landing site:** Roughly 500 miles west of the coast of Mexico.

Mission Overview: First Test Flight of Dragon Spacecraft, First Commercial Company to Attempt Re-Entry from Orbit.

SpaceX will launch its Dragon spacecraft atop the Falcon 9 rocket. Dragon will make almost 2 orbits of the Earth, and land in the Pacific Ocean approximately 3 ½ hours later.

Falcon 9 first successfully launched on June 4th, 2010.

The Dragon spacecraft, although much smaller, is just as complex as the Falcon 9. In addition to being the first flight of an operational Dragon, there are many new systems and elements that will be tested for the first time in space — structural integrity of the pressure vessel, precision firing of the 18 SpaceX Draco engines, telemetry, guidance, navigation and control systems, the heat shield, and parachutes—to name a few. It is also the first attempt by acommercial company to recover a spacecraft reentering from low-Earth orbit, a feat only performed by 5 nations - the United States, Russia, China, Japan, and India – and the European Space Agency. The June 4th launch included a Dragon that was aerodynamically equivalent to a fully operational Dragon spacecraft but lacked elements such as the heat shield, propulsion thrusters, avionics, or a recovery system, and was not recovered.

Recovery & Reusability

After travelling approximately 50,000 miles, the Dragon spacecraft is expected to land in the Pacific Ocean about 500 miles off of the coast of Mexico approximately three and a half hours after launch.

The landing location is controlled by firing the Draco thrusters during reentry. On this mission, Dragon would be recovered by ship. Long term, once SpaceX has proven our ability to control reentry accurately, we intend to add deployable landing gear to touch down on land.

In a carefully timed sequence of events, dual drogue parachutes deploy at 45,000 feet to stabilize and slow the spacecraft. Full deployment of the drogues triggers the release of the main parachutes, each 116 feet in diameter, at about 10,000 feet, with the drogues detaching from the spacecraft. Main parachutes further slow the spacecraft's decent to approximately 16-18 ft/sec. Oversized parachutes are critical in ensuring a safe landing for crew members. Even if Dragon were to lose one of its main parachutes, the two remaining chutes would still ensure a safe landing.

Both the Dragon spacecraft and the first stage of the Falcon 9 are designed to be reusable. Reusability is a key element to SpaceX's long term goal of increasing the reliability and reducing the cost of spaceflight by a factor of ten.

NASA's MV Freedom Star recovery ship, normally responsible for recovering the space shuttle's solid rocket boosters, will be used should recovery of Falcon 9 rocket's first stage be possible. Reusability is a long term goal. SpaceX expects to make progress on this goal, but full recovery will take many missions to achieve.

Mission Objectives

As this is a test launch, SpaceX's primary goal is to collect as much data as possible.

Key Milestones

- Launch
- Separation
- Safe reentry

Regardless of the outcome, this first launch attempt represents a key milestone for both SpaceX and the commercial spaceflight industry.

****Actual timing will vary with specific mission requirements.*

Countdown:

T-02:35:00	Chief Engineer polls stations. Countdown master autosequence proceeds with Liquid Oxygen (LOx) load, RP-1 fuel load, and vehicle release.
T-01:40:00	Allow countdown master autosequence to proceed into lowering the strongback
T-00:60:00	Allow the master autosequence to proceed with stage 2 fuel bleed, stage 2 thrust vector control bleed. Verify all sub-autosequences in the countdown master autosequence have been performed, except for terminal count.
T-00:13:00	SpaceX Launch Director polls readiness for launch.
T-00:11:00	Logical hold point

TERMINAL COUNT (begins at T-10min)

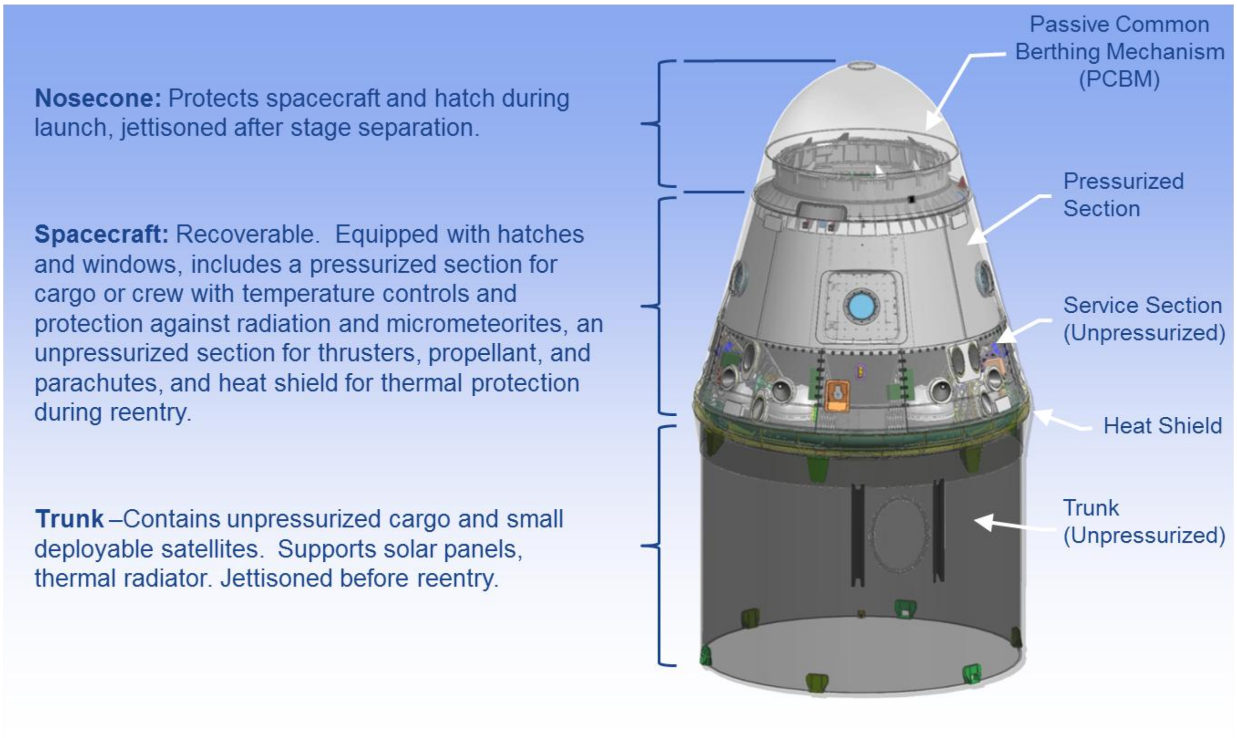
T-00:09:43	Open prevalves to the nine first stage engines and begin chilling Merlin engine pumps
T00:0-6:17	Command flight computer to enter alignment state
T-00:05:00	Stop loading of GN2 into ACS bottle on stage 2
T-00:04:46	Transfer to internal power on stage 1 and stage 2
T-00:03:11	Begin arming flight termination system
T-00:03:02	Terminate LOx propellant topping, cycle fuel trim valves
T-00:03:00	Verify movement on stage 2 thrust vector control actuators
T-00:02:30	SpaceX Launch Director verifies "GO"
T-00:02:00	Range Control Officer (Air Force) verifies range is "GO"
T-00:01:35	Terminate helium loading
T-00:01:00	Command flight computer state to startup
T-00:01:00	Turn on pad deck and Niagara water
T-00:00:50	Flight computer commands thrust vector control actuator checks on stage 1
T-00:00:40	Pressurize S1 and S2 propellant tanks
T-00:00:03	Engine controller commands engine ignition sequence to start

T-00:00:00 Liftoff

T+0:02:58	1st Stage Shut Down (Main Engine Cut Off)
T+0:03:02	1st Stage Separates
T+0:03:09	2nd Stage Engine Start
T+0:09:00	2nd Stage Engine Cutoff
T+0:09:35	Dragon Separates from Falcon 9 and initializes propulsion
T+0:13	On-Orbit Operations
T+2:32	Deorbit Burn Begins
T+2:38	Deorbit Burn End
T+2:58	Reentry Phase Begins (Entry Interface)
T+3:09	Drogue Chute Deploys
T+3:10	Main Chute Deploys
T+3:19	Water Landing

Dragon is a free-flying, reusable spacecraft being developed by SpaceX under NASA's Commercial Orbital Transportation Services (COTS) program. Initiated internally by SpaceX in 2005, the Dragon spacecraft is made up of a pressurized capsule and unpressurized trunk used for Earth to LEO transport of pressurized cargo, unpressurized cargo, and/or crew members.

Dragon Spacecraft



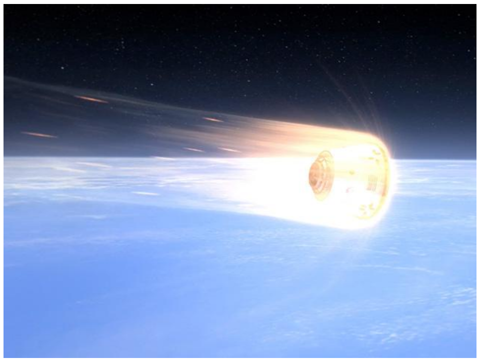
Dragon Highlights:

- Fully autonomous rendezvous and docking with manual override in crewed configuration
- Capable of carrying over 3 metric tons in each of the pressurized and unpressurized sections.
- Payload Volume: 10 m3 (245 ft3) pressurized, 14 m3 (490 ft3) unpressurized
- Supports 5 - 7 passengers in crew configuration
- Two-fault tolerant avionics system with extensive heritage
- Reaction control system with 18 MMH/NTO thrusters designed and built in-house; these thrusters are used for both attitude control and orbital maneuvering
- Integral common berthing mechanism, with low-impact docking system (LIDS) or androgynous peripheral attach system (APAS) support if required
- Lifting re-entry for landing precision and low-g's

Key Components

One of the challenges of the first flight of the Dragon spacecraft is that several key components will be tested at the same time, many of which have never been tested in orbit before.

Draco Thrusters: Dragon is controlled throughout flight and reentry by the onboard Draco thrusters that allow Dragon to precisely approach and berth with the International Space Station and will enable the spacecraft to touchdown at a very precise location – ultimately within a few hundred yards of its target. Draco thrusters must perform a multiple-minute deorbit burn and then pulse on the order of tens of milliseconds to control attitude during reentry trajectory. SpaceX's long-term goal is to land Dragon on land. Once the ability to control reentry accurately has been proven, SpaceX intends to add deployable landing gear and leverage the thrusters in order to land on land.



PICA-X Heat Shield: Dragon will reenter the Earth's atmosphere like a burning comet, experiencing temperatures between 3,000 and 4,000 degrees Fahrenheit. To keep the vehicle's interior at room temperature, SpaceX worked closely with NASA to develop PICA-X, a SpaceX variant of NASA's phenolic impregnated carbon ablator (PICA) heat shield.

SpaceX chose PICA for its proven ability. In January 2006, NASA's Stardust sample capsule returned using a PICA heat shield and set the record for the fastest reentry speed of a spacecraft into Earth's atmosphere — experiencing speeds of 28,900 miles per hour.

NASA made its expertise and specialized facilities available to SpaceX as the company designed, developed and qualified the 3.6 meter PICA-X shield it in less than 4 years at a fraction of the cost NASA had budgeted for the effort. The result is the most advanced heat shield ever to fly, it can potentially be used hundreds of times for Earth orbit reentry with only minor degradation each time (like an extreme version of a Formula 1 car's carbon brakepads) and can even withstand the much higher heat of a moon or Mars velocity reentry.

Avionics: Dragon will need to operate on its own power, relying on its newly developed lithium battery, and complete a series of maneuvers that test its guidance, navigation and control systems.

Telemetry: For mission control to talk to the vehicle, Dragon will have to close a link with a series of ground stations all around the world and as well as the space based NASA Tracking and Data Relay Satellite constellation in orbit 22,000 miles away.

Parachutes: Dual drogue parachutes slow and stabilize the craft before three main parachutes bring it to a gentle landing. Dragon can also land safely with only one drogue and one main parachute if needed.

The view from inside: After the Space Shuttle retires, the Dragon spacecraft will be used to carry cargo to and from the International Space Station for NASA. Visiting NASA astronauts Cady Coleman and Scott Kelly get a sneak peek inside the spacecraft.

Transporting Crew

To ensure a rapid transition from cargo to crew, SpaceX has designed the cargo and crew configurations to be nearly identical, with notable exceptions including the need for a crew escape system, the life support system, and onboard controls that allow the crew to take control from the flight computer when needed. This focus on commonality minimizes the design effort and simplifies the human- rating process, allowing systems critical to Dragon crew safety and ISS safety to be fully tested on unmanned demonstration flights.

SpaceX | Falcon 9 Overview

Falcon 9 saw its first successful launch on June 4th, 2010. The second launch of the Falcon 9 rocket poses significant challenges. Of the world's current launch vehicle families, 75% have had at least 1 failure in the first 3 flights. If the rockets that flew only once are not counted, there were more failures on the second flight (7) than on the first (6).

Falcon 9 is a two-stage, liquid oxygen and rocket grade kerosene (RP-1) powered launch vehicle. It was designed from the ground up by SpaceX for the reliable and cost efficient transport of satellites to low Earth orbit, geosynchronous transfer orbit, and for sending SpaceX's Dragon spacecraft, including manned missions, to orbiting destinations such as the International Space Station.

Length:	47 meters	(157 feet with Dragon)
Width:	3.6 meters	(12 feet)
Mass:	333,400 kg	(735,000 pounds)

First Stage

The Falcon 9 tank walls and domes are made from an aluminum lithium alloy. SpaceX uses an all friction-stir-welded tank, the highest strength and most reliable welding technique available.

Nine SpaceX Merlin regeneratively cooled engines power the Falcon 9 first stage. After ignition of the first stage engines, the Falcon 9 is held down and not released for flight until all propulsion and vehicle systems are confirmed to be operating nominally.

The Merlin Vacuum engine expansion nozzle, used on the second stage, measures 9 feet tall.

Like Falcon 1, the interstage, which connects the upper and lower stage for Falcon 9, is a carbon fiber aluminum core composite structure. The separation system is a larger version of the pneumatic pushers used on Falcon 1.

Second Stage

The second stage tank of Falcon 9 is simply a shorter version of the first-stage tank and uses most of the same tooling, material and manufacturing techniques. This results in significant cost savings in vehicle production.

A single Merlin engine powers the Falcon 9 upper stage with an expansion ratio of 117:1 and a nominal burn time of 345 seconds. For added reliability of restart, the engine has dual redundant pyrophoric igniters (TEA-TEB).

Merlin Engine

Falcon 9 is powered by 9 Merlin engines in the 1st stage, and 1 in the second stage. The nine Merlin engines generate one million pounds of thrust in vacuum. The Merlin engine was developed internally at SpaceX, but draws upon a long heritage of space proven engines. The pintle-style injector at the heart of Merlin was first used in the Apollo Moon program for the lunar module landing engine, one of the most critical phases of the mission.

Propellant is fed via a single-shaft, dual- impeller turbo-pump operating on a gas generator cycle. The turbo-pump also provides the high pressure kerosene for the hydraulic actuators, which then recycles into the low pressure inlet. The design approach eliminates the need for a separate hydraulic power system and means that thrust vector control failure by running out of hydraulic fluid is not possible. A third use of the turbo-pump is to provide roll control by actuating the turbine exhaust nozzle (on the second stage engine).

Combining the above three functions into one device that we know is functioning before the vehicle is allowed to lift off means a significant improvement in system level reliability.

1st Stage Engines		2nd Stage Vacuum Engines	
Sea Level Thrust :	423 kN (95,000 lbf)	Vacuum Thrust:	411 kN (92,500 lbf)
Vacuum Thrust:	483 kN (108,500 lbf)	Vacuum Isp:	336s
Sea Level Isp:	266s		

With a vacuum specific impulse of 336s, Merlin is the highest performing American hydrocarbon rocket engine ever flown.

Reliability

An analysis of launch failure history between 1980 and 1999 by Aerospace Corporation showed that 91% of known failures can be attributed to three causes: engine, stage separation and, to a much lesser degree, avionics failures. Falcon 9 addresses the top two problems by having only two stages and nine Merlin engines clustered together to make up the first stage. The vehicle is capable of sustaining an engine failure and still successfully completing its mission. SpaceX's nine-engine architecture is an improved version of the architecture employed by the Saturn V and Saturn I rockets of the Apollo Program, which had flawless flight records despite losing engines on a number of missions.

SpaceX uses a hold-before-release system — a capability required by commercial airplanes, but not implemented on many launch vehicles. After the first-stage engine ignites, the Falcon 9 is held down and not released for flight until all propulsion and vehicle systems are confirmed to be operating normally. An automatic safe shut-down occurs and propellant is unloaded if any issues are detected.

In December 2008, NASA announced the selection of SpaceX's Falcon 9 launch vehicle and Dragon spacecraft to resupply the International Space Station (ISS) when the Space Shuttle retires. NASA cited SpaceX's significant strengths as follows:

- First-stage engine-out capability
- Dual redundant avionics system
- Structural safety factor in excess of industry standards
- Enhanced schedule efficiencies
- Reduced overall technical risk to ISS cargo supply

SpaceX | Space Launch Complex 40, Cape Canaveral Air Force Station

The Falcon 9 launch site at Space Launch Complex 40 (SLC-40), on Cape Canaveral Air Force Station (CCAFS), is located on the Atlantic coast of Florida, approximately 5.5 km (3.5 miles) southeast of NASA's space shuttle launch site.

View looking west, showing SpaceX's Space Launch Complex 40 launch site, Cape Canaveral Air Force Station, with the Falcon 9 Flight 1 vehicle on the launch pad at the center.

Starting in 1965, SLC-40 saw the launch of a total of 55 Titan III and Titan IV rockets, including the 1997 launch of NASA's Cassini spacecraft, now orbiting Saturn. The Titan rockets were among the largest vehicles in the US fleet – second only to the giant Saturn V moon rocket.

The last Titan IV launch from SLC-40 occurred in April of 2005. SpaceX, Cape Canaveral's first purely commercial launch program, began demolition of the old site in November of 2007 and started upgrading and renovating the complex for Falcon 9 launches in May 2008.

In just over 24 months from initial occupancy of the pad, SpaceX was able to completely renovate the pad using a small crew and successfully launched its inaugural Falcon 9 booster on June 4th 2010. With plans to launch 10 to 12 missions per year in support of NASA space station resupply and commercial satellite customers, SpaceX is building on the strong heritage of Space Launch Complex 40.

About SpaceX

In an era when most technology based products follow a path of ever-increasing capability and reliability while reducing costs, launch vehicles today are little changed from those of 40 years ago.

SpaceX is changing this paradigm by delivering a family of launch vehicles that will increase reliability and performance of space transportation, while ultimately reducing costs by a factor of ten.

The company is based on the philosophy that through simplicity, reliability and low-cost can go hand in hand. By eliminating the traditional layers of management, internally, and sub-contractors, externally, SpaceX reduces costs while speeding decision making and delivery. By manufacturing the vast majority of our vehicles in house, we keep tighter control of quality, reduce costs, and ensure a tight feedback loop between the design and manufacturing teams. And by focusing on simple, proven designs with a primary focus on reliability, we reduce the costs associated with complex systems.

With the Falcon 1 and Falcon 9 rockets, SpaceX has a diverse manifest of missions to deliver commercial and government satellites to orbit. This includes a $492 million contract with Iridium announced in June, the single largest commercial launch deal ever signed.

Next year, the Falcon 9 and SpaceX's Dragon spacecraft will start carrying cargo, including live plants and animals, to and from the International Space Station for NASA. Both Falcon 9 and Dragon were developed to one day carry astronauts.

Founded in 2002, SpaceX is a private company owned by management and employees, with minority investments from Founders Fund, Draper Fisher Jurvetson, and Valor Equity Partners. The company has over 1,200 employees in California, Texas and Florida. For more information, and to watch the video of the first Falcon 9 launch, visit the SpaceX website at SpaceX.com.

Vehicles are designed and manufactured at SpaceX headquarters, a 550,000-square-foot facility in Hawthorne, CA that is home to mission control.

LEFT: Testing happens at a 300-acre state-of-the-art propulsion and structural test facility in McGregor,TX.

RIGHT: The Falcon 1 launched from our launchpad on Omelek Island in the Kwajalein Atoll.

Elon Musk – CEO and CTO

Elon Musk founded SpaceX in 2002 and serves as both Chief Executive Officer and Chief Technology Officer. Musk served as chief engineer for Falcon 1, the first privately developed liquid-fueled rocket to reach orbit, and both the Falcon 9 and Dragon spacecraft.

Musk is also CEO and Product Architect of Tesla Motors, where he oversees product development and design, including for the all-electric Tesla Roadster and Model S sedan and the non-executive chairman of SolarCity, the leading provider of solar power systems in California.

Before founding SpaceX, Musk co-founded PayPal, the world's leading electronic payment system, and served as the company's chairman and CEO. PayPal went public in early 2002 and was sold to eBay later that year. Musk's first company was an Internet software company called Zip2. He co-founded Zip2 in 1995, serving initially as CEO and then as CTO. Zip2 was sold to Compaq in 1999.

Musk earned two degrees from the University of Pennsylvania-one in physics and another in business from the Wharton School. He currently serves as a member of the Stanford University Engineering Advisory Board and is a trustee of Caltech, the X Prize Foundation, and the Musk Foundation.

Gwynne Shotwell – President

Gwynne Shotwell is President of SpaceX, responsible for managing all customer and strategic relations to support company growth, as well as management of day-to-day operations at SpaceX. She joined SpaceX in 2002 as Vice President of Business Development, developing SpaceX's customer base and strategic relations.

Prior to joining SpaceX, Shotwell spent over ten years at the Aerospace Corporation where she held positions in Space Systems Engineering and Technology and Project Management including as Chief Engineer of an MLV-class Satellite program, managing a landmark study for the Federal Aviation Administration's on Commercial Space Transportation, and completing an extensive space policy analysis for NASA's future investment in space transportation. After Aerospace Corporation, Ms. Shotwell was recruited to be manager of the Space Systems Division at Microcosm, where she served on the Executive Committee and directed corporate business development.

In 2004, she was elected to the California Space Authority Board of Directors and serves on its executive committee. She has also served as an officer of the Space Systems Technical Committee. Shotwell received her Bachelor's and Master's Degree from Northwestern University in Mechanical Engineering and Applied Mathematics. She has authored papers in a variety of areas including standardizing spacecraft/payload interfaces, conceptual small spacecraft design, infrared signature target modeling, shuttle integration, and reentry vehicle operational risks.