

ARCHIVED REPORT

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XCOR Lynx

Outlook

- Three of XCOR's four cofounders left the company in November 2015
- By May 2016, XCOR pivoted away from developing a spacecraft to rocket engine development
- With pivot toward rocket engine development, Lynx will not fly for foreseeable future
- XCOR moved its headquarters and R&D facilities from Mojave, California, to Midland, Texas

Orientation

Description. The XCOR Lynx is a suborbital spaceplane designed to take off and land horizontally, and to be reused.

Sponsor. XCOR Aerospace is a privately held rocket engine and spaceflight company based in Mojave, California.

Status. On hold.

Total Produced. One Lynx Mark I has been produced and is being used for testing purposes.

Application. The Lynx is designed to carry paying passengers into suborbital space. It will carry tourists as well as institutional researchers.

Price Range. XCOR is a private company and does not disclose how much it is spending to design and build the Lynx spaceplane. As of mid-2014, XCOR is estimated to have generated \$88 million in ticket sales, financing, and government incentives. Some of that money went toward development of the Lynx.

A ticket on an XCOR Lynx flight costs about \$95,000. Effective January 1, 2016, ticket prices were raised to \$150,000.

Contractors

Prime

XCOR Aerospace	http://www.xcor.com , 1314 Flight Line, Mojave, CA 93501 United States, Tel: + 1 (661) 824-4714, Prime
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XCOR Lynx

Subcontractor

AdamWorks	http://www.adamworksinc.com , 7367 S Revere Pkwy #2, Centennial, CO 80112 United States, Tel: + 1 (303) 200-6655 (Carbon Fiber Cockpit)
Orbital ATK, Aerospace Structures	http://www.orbitalatk.com , Freeport Center, Bldg H-8, PO Box 160433, Clearfield, UT 84016 United States, Tel: + 1 (801) 775-1262 (Wing)

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

Design Features. XCOR Aerospace is a small company developing a rocket-powered spaceplane to carry paying passengers and payloads into suborbital space. The company's entry into that market (sometimes referred to as the space tourism industry) is the Lynx.

The Lynx is a two-seat spaceplane designed to take a pilot as well as one passenger and/or a small payload to 100 kilometers (330,000 ft). The spaceplane is planned to operate at that altitude for about a half-hour and then land. The Lynx is designed to both take off and land horizontally. Because it can conduct horizontal takeoff and landing operations, XCOR believes the Lynx will have a fast turnaround time, being able to launch up to four times a day.

The Lynx is about 9 meters (30 ft) in length, and has a 7.5-meter (24-ft) wingspan. It is built using composite materials. Earlier versions of the Lynx will be able to carry 120 kilograms (265 lb) to altitude, while later versions will increase that figure to 650 kilograms (1,433 lb). Weight can be divided between passengers and payloads.

The Lynx will utilize four XR-5K18 rocket engines, designed and built by XCOR. The engine produces up to 12.9 kN (2,900 lbf) thrust in a vacuum by burning oxygen and kerosene. The engine has a stop-restart capability.



Lynx Suborbital Vehicle

Source: Mike Masee/XCOR

Variants/Upgrades

EZ-Rocket. XCOR's first demonstrator rocket-powered vehicle was known as the EZ-Rocket. It consisted of a modified "Long-EZ" homebuilt airplane, with two 400 lbf thrust rocket engines. The purpose of the aircraft was to demonstrate and practice designing a simple and cost-effective rocket-plane. EZ-Rocket was flown 26 times, and had a cost of \$900 per flight.

Xerus. XCOR's next developmental vehicle was the Xerus (pronounced zEr'us). XCOR began development of Xerus in 2002, and actually intended to operate the vehicle as its primary spaceplane.

Lynx Mk I. By 2008, XCOR unveiled plans for a new spaceplane known as the Lynx. The first version of the

Lynx will have a maximum altitude of 62 kilometers (203,000 ft), and will be able to carry 120 kilograms.

Lynx Mk II. XCOR eventually plans to unveil the Lynx Mk II, which will be capable of reaching an increased maximum altitude of 107 kilometers (351,000 ft).

Lynx Mk III. The ultimate goal of the Lynx program is to develop the Lynx Mk III, which will include an external dorsal-mounted pod that can carry 650 kilograms (1,530 lb) of cargo. It will also be able to launch microsatellites into low-Earth orbit.

Program Review

Background. XCOR Aerospace was founded in 1999. The company has a plan to gradually develop technologies needed to carry paying passengers as well as cargo into space. Early efforts centered on developing technologies needed to create a spaceplane. These efforts included development of rocket motors and work on early designs such as EZ-Rocket and Xerus. XCOR filed its first complete application with the U.S. Federal Aviation Administration to operate reusable launch vehicles in 2013.

In March 2008, XCOR introduced the Lynx spaceplane. The system was introduced as a piece in a larger roadmap toward ever-more-capable spacecraft. Development of the Lynx has been slow. Originally, it was intended to launch in 2010, but the complexity of building a rocket has pushed back first launch.

Progress has continued on the spaceplane, both on the business side and technical development side. In December 2009, XCOR agreed to a wet lease with Yecheon Astro Space Center of South Korea. The center will use the Lynx for research, education, and tourism, and XCOR will operate the spacecraft. In September 2011, Space Experience Curacao (SXC) signed a wet lease for another Lynx to be used for space tourism.

Also, XCOR agreed to move its headquarters and research and development center to Midland, Texas, in return for \$10 million in incentives from the state and local government. The agreement was announced in July 2012, and construction on a new facility began in August 2014. In addition, XCOR is moving its production facility to the Kennedy Space Center in Florida in return for \$5.7 million in incentives.

On the technical side, XCOR conducted wind tunnel testing of its Lynx spaceplane through early 2012. At that point, the company completed the Lynx design and started construction. In September 2014, XCOR integrated the cockpit with the fuselage. Other components, such as landing gear, were also integrated at that point. The wings, being developed by Orbital ATK, were to be integrated at a later date.

However, progress on the Lynx slowed down after September 2014. By November 2015, three of the XCOR cofounders, Jeff Greason, Dan DeLong, and Aleta Jackson, left the company to found a space technology consulting firm. In May 2016, 25 employees were laid off and development of the Lynx was put on hold while XCOR shifted focus to developing the 8H21 cryogenic engine for ULA.

XCOR Lynx**Timetable**

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1999	XCOR Aerospace founded
Mar	2008	Lynx spaceplane introduced
Dec	2009	XCOR agreed to lease a Lynx to Yecheon Astro Space Center
Sep	2011	XCOR agreed to lease a Lynx to Space Experience Curacao (SXC)
Jan	2012	Lynx design completed
Jun	2012	SXC named general sales agent for Lynx flights
Aug	2014	Construction started on new Midland, Texas, R&D facility
Sep	2014	Cockpit and fuselage integrated
Nov	2015	Three XCOR cofounders leave the company
May	2016	25 employees laid off as XCOR shifts focus to engine development

Forecast Rationale

XCOR Aerospace was one of a handful of companies working to make spaceflight more accessible to people. Unlike Virgin Galactic or Blue Origin, XCOR is not backed by an extremely wealthy individual. Without extremely wealthy backers, the company has had a more difficult time financing development. As a result, three of its four cofounders have left the company, while the remaining leadership has pivoted away from developing a spacecraft to focusing on rocket engine development.

At one point, XCOR's conservative development plan seemed to be paying off. The company made a number of technological breakthroughs, while more than 200 customers signed up for flights on the Lynx. However,

without a wealthy investor able to eat the costs of no revenue generation for years, the company was forced to shift gears.

XCOR was awarded a contract by ULA in March 2016 to develop its 8H21 LO2/LH23 engine. The engine will compete against rocket engines being developed by Blue Origin and Aerojet Rocketdyne to equip the upper stage on ULA's developmental Vulcan launch vehicle. With a signed contract in hand, XCOR pivoted away from developing a human spaceflight vehicle to engine development. Any development of a Lynx vehicle will likely not occur for at least a decade and possibly never.

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