

## Preface

For years after SpaceShipOne won the X-Prize, all you ever heard in the commercial spaceflight business was when SpaceShipTwo would begin revenue flights. Initially, Paris Hilton and her celebrity friends were due to take their suborbital joyride in 2007, but an explosion that killed three workers put paid to that deadline. Then 2010 was announced as the start of revenue operations but, by the end of 2010, still no passengers had flown. 2010 became 2011, which became 2012 and still there were no flights. Then, tragically, in October 2014, SpaceShipTwo crashed, killing one of the pilots and injuring the other. The public wondered whether passengers would ever fly in space, oblivious to the work of a company that also had suborbital aspirations and which was located just a stone's throw down the flight line from Virgin Galactic. That company's name is XCOR and its snappy little spaceship is the Lynx.

The Lynx has been in the works for years, but XCOR, unlike some companies, prefer to let their deeds do the talking. No bold pronouncements of when revenue flights will start from this company. Over the years, XCOR has amassed invaluable expertise in the building of suborbital vehicles: in addition to having developed and built 13 different rocket engines, XCOR has also accumulated more than 4,000 engine firings and more than eight hours of run time on their engines. With the travails of Virgin Galactic putting the future of SpaceShipTwo on a back foot, XCOR has been thrust into the spotlight of the commercial space industry and is on the cusp of conducting flight testing of the Lynx Mark I.

The Lynx has two seats – one for a pilot and one for a spaceflight participant. Its low weight and high-octane fuel confer important advantages over SpaceShipTwo that include direct runway launches without the complication and expense of a mother ship and the ability to fly several times per day. Like SpaceShipTwo, the Lynx is a rocket-powered airplane, but that's about the only similarity. Powered by four XCOR-built kerosene and liquid-oxygen engines, the Lynx's take-off speed is 190 knots, and it can get airborne with only 350 meters of runway. The all-liquid design is more efficient than SpaceShipTwo's hybrid propulsion, providing more thrust per pound of fuel. All-liquid fuel should also give the Lynx a fast turnaround between flights because crews can just top up the tanks and fly again, whereas SpaceShipTwo's engine must be replaced between flights.

Passengers paying US\$150,000 (\$100,00 less than Virgin Galactic's ticket price) will ride beside the pilot. Both pilot and passenger will wear pressure suits as a safety measure in case cabin pressure is lost during the flight. Unlike SpaceShipTwo customers, Lynx passengers will not be able to unstrap and float about the cabin after the engine cut-off. All being well, revenue flights could start sometime in 2019. That's 15 years after the X-Prize-winning flight of SpaceShipOne and there may be some who are wondering why this suborbital spaceflight business has taken so long. The answer is money. XCOR never had the deep pockets of a Virgin Galactic, a SpaceX, or a Blue Origin. This is a company that has accomplished what many industry wags thought impossible on a budget that NASA uses to put together a few PowerPoint presentations. And it has done so thanks to the incredible dedication and perseverance of a handful of extraordinarily talented individuals who had the intestinal fortitude to take risks and to dream big. Take Jeff Greason for example. We'll talk about Jeff at some length in this book but here's a snapshot of the man with the vision that morphed into what XCOR is today.



The XCOR team. Credit: XCOR

Jeff has been space enthusiast his whole life so, when an opportunity to take the job as head of propulsion with Rotary Rockets came about in 1997, he jumped at the chance. It was a bold – some may say reckless – move, given that he left a lucrative career as an

engineer with Intel, but “bold” is what Jeff does. Two years later, Rotary folded and Greason, together with a small group of Rotary engineers, formed XCOR. More than 16 years later, they are still together<sup>1</sup> and are on the cusp of making history as the first company to start a suborbital flight service. And, when that service starts, the pilot at the controls will likely be three-time Shuttle astronaut Rick Searfoss. With Searfoss and his passenger ensconced in their pressure suits, the Lynx will taxi off the ramp and wait for clearance from the tower at Midland. Once clearance has been given, the Lynx will get airborne in seconds thanks to the eye-popping acceleration provided by those engines. Less than a minute after take-off, the Lynx will be accelerating through Mach 1 and the sky that was blue just a few seconds earlier will rapidly fade to black. With the flip of a few switches, Searfoss will shut down the engines and momentum will do the rest as the vehicle coasts to its apex more than 100 kilometers above Earth. There, for up to four minutes, passengers – now astronauts – will take in the jaw-dropping view, unless they happen to be scientists, in which case they will have to knuckle down to following their checklists. All too soon, the suborbital joyride will be over and the Lynx will glide back to its home airport, ready to do it all over again.

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<sup>1</sup> In November 2015 it was announced that Jeff, together with two other founders of XCOR Aerospace, were leaving the company to form Agile Aero. While Jeff remains on the board, he is no longer involved in XCOR’s day-to-day operations.

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