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# FIREFLY STAGES COMEBACK

Two years after going dark, a Texas rocket startup is ready to light up the sky

## INSIDE


- Liftoff for Britain's launch industry
- Europe's next-generation journey
- Small rockets get a timely boost

# Firefly's comeback

**The Texas launch startup is "back in full force" following last year's near-death experience**

Building on the Firefly Alpha, the **Firefly Beta** will rely on 12 Reaver first-stage engines and a Lightning upper stage to carry 4,000 kilograms to low Earth orbit.

**Two years ago,** Firefly Space Systems appeared to be flying high. The Texas company had more than 150 employees and was making progress on a small launch vehicle called Alpha. The company was one of three that won NASA contracts for smallsat launches, with plans to carry out that launch in early 2018.

Then the bottom fell out of the company. In late September 2016 the company announced it was furloughing its entire staff, citing financial problems when an unnamed investor backed out. The company limped along using loans until last spring, when Noosphere Ventures, a fund that was one of Firefly's creditors, acquired the company's assets in an auction. With new ownership, but some of the same management, the new Firefly Aerospace quietly started operations.

Firefly isn't quiet any more, though. The company is actively developing a new version of its Alpha launch vehicle slated to make a first launch next fall from California and actively marketing that vehicle, with strong financial backing from its new owners.

**JEFF FOUST**

"Firefly is back in full force," Tom Markusic, chief executive of Firefly, said in a recent interview. "We're not a company that's struggling to get back on its feet."

## Building Alpha

That "full force" has include extensive development work of a new, larger version of the Alpha launch vehicle. "We're transitioning right now into that full vehicle integration stage," he said, with testing of the vehicle's upper stage set to begin soon.Alpha is a two-stage vehicle with a lower stage powered by four of the company's Reaver engines, each producing more than 40,000 pounds-force of thrust. The upper stage has a single Lightning engine, also developed at Firefly, with about 15,000 pounds-force of thrust.

The Lightning engine has been fully tested, Markusic said, allowing the company to move ahead with testing of the complete second stage. "There's a lot of commonality between the first and second stage, with the exception of the engine," he said. "So, we'll learn a lot just getting the full second stage going in the coming months."

Markusic said he anticipates going into qualification testing of the second stage

FIREFLY

One of the four Reaver engines that power the Firefly Alpha's first stage undergoes a short-duration test at the company's Briggs, Texas, development facility.

near the end of the year. Those tests will involve full duration tests of the stage and then "exploring of corners of the box" of the stage's performance. "After you've done that, you're ready to start producing flight hardware."

Around the time the second stage goes into qualification testing, the first stage should be ready for its initial tests. Work is still continuing on its Reaver engines, in particular its turbopump assembly, and he estimated that testing of the turbopump should begin in October.

Other aspects of Alpha, including its avionics, software and structures, are going well and in some cases ahead of schedule. Markusic said the company was on track for a first launch in September 2019.

Firefly has selected a launch site for its initial missions. In May, the company announced an agreement with the U.S. Air Force to take over Space Launch Complex 2 West (SLC-2W), a launch pad currently used by United Launch Alliance's Delta 2. That pad will become available to Firefly after the venerable Delta 2 performs its final launch there in mid-September.

"There's a lot of preliminary work that needs to be done" about using that launch pad, from flight safety analyses to the logistics of taking it over from ULA. "It looks like the Delta 2 launch is on schedule, and we'll be able to begin the handoff soon after that launch."

He said the company is in "very active discussions" for a second launch site on the East Coast to handle missions to lower inclination orbits. The three currently under consideration are Cape Canaveral, the proposed Spaceport Camden in Georgia and Wallops Flight Facility in Virginia.

Markusic expects to choose one of those three soon, a decision that could be tied to selecting a site for a factory for large-scale production of Alpha. "We're going to make a decision this quarter," he said.

## Selling Alpha

As the company prepares the Alpha and its launch sites, it's stepping up efforts to sign up customers. In June, the company announced its first firm launch contract, with Surrey Satellite Technology. That deal covers up to six Alpha launches from 2020 to 2022, starting with SSTL's Carbonite-4 technology demonstration satellite.

"We have a large catalog of letters of intent, which of course are nonbinding, but at least give you some sense of where the market is," he said. He declined to give a specific number of launches covered by those letters, other than it's "more launches than we can probably do."

Firefly is looking to the U.S. government as one of its markets. "We're very interested in a government customer for our first and second launches, and we're actively talking to folks about that," he said. Firefly recently established a Washington office and hired Les Kovacs, former director of executive branch affairs at ULA, as its vice president of business development.

One of the major decisions the new incarnation of Firefly made was to scale up the Alpha vehicle, which can now place up to 1,000 kilograms into low Earth orbit versus the 200 kilograms of the original version. Markusic said that reflects what the market is looking for both in terms of price and performance.

"If we can build this rocket and get >

FIREFLY

Firefly's vertical test stand awaits installation of second-stage development tanks.

**In Texas, about half of Firefly's 140 employees worked for the earlier Firefly.**

< > it to flight on time, we will have no problem filling up our launch manifest," he said. "All the feedback we're getting so far from commercial customers, both domestic and international, and government customers says that this will be a vehicle that will be in high demand."

The competition, he says, is also trending toward larger vehicles. "If you look at some of the new entrants, the very new ones, they're essentially copying our payload class and price point," he said. "To me, that reflects that smart people have looked at this, and looked at the market, and concluded we're in the right spot."

## Beta and beyond

In the interview, Markusic reiterated past statements that he sees the biggest competition to Alpha coming from outside the U.S., particularly from China as well as India's Polar Satellite Launch Vehicle, which has become a popular option for launching smallsats as secondary payloads.

"I continue to believe that India's PSLV and perhaps some of the Chinese entrants are our primary competition," he said. "Alpha is not going to completely win that battle. That's why we've announced our intention to build a vehicle called Beta."

Beta is analogous to the Delta 4 Heavy or the Falcon Heavy, with three Alpha first stages and an Alpha second stage. It would be able to place up to 4,000 kilograms into low Earth orbit and at a lower cost than the PSLV. "Beta marks where I think we no doubt dominate the small to medium launch market competing against existing launch vehicles," he said.

Beta is only a conceptual design at this point. "Right now we've very much focused on Alpha," Markusic said. "We've got our hands full meeting the September 2019 launch date, so we're not working on Beta quite yet."

However, he was optimistic that, if Alpha is a success, Beta should be straightforward to develop because of its use of Alpha hardware. "That's not to say there won't be technical challenges associated with doing a triple-core configuration like that, but it is less challenging than doing a clean-sheet rocket."

Developing Beta opens up other markets for the company. One that Markusic highlighted is NASA's return to the moon. "Commercial lunar cargo is something that's interesting to us as a potential large-scale growth path for the company," he said.

That could start with providing launch services to companies developing lunar lander missions for NASA's Commercial Lunar Payload Services program.

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The Firefly Beta rocket will stand roughly 34 meters tall.

FIREFLY

However, he suggested Firefly could develop its own landers someday, drawing an analogy of how NASA's commercial cargo program allowed SpaceX to go from just building launch vehicles to building spacecraft as well.

"I think that Commercial Lunar Payload Services potentially offers that kind of opportunity for Firefly, where we go from Alpha to Beta, which is very well suited to some of the precursor landers, and then to even having the in-house lander capability, which gets us into that spacecraft area," he said. "That's something we're looking at carefully and seeing if we want to engage in that."

The company is open to other unconventional opportunities. Markusic said one option Firefly is considering is being a supplier of launch vehicle components, like engines, to other companies. "One thing that I think that's unfortunate about NewSpace and the development of these new launch companies is you have start from scratch," he said. "What I would ultimately do is to have Firefly become the OEM supplier for NewSpace."

Why, though, would Firefly want to sell components to potential competitors? "You can do economies of scale, if we're using parts on our vehicle and people are using them on their vehicles," he said. "We're producing more of them and driving everyone's costs down, which is one of the ultimate core goals of NewSpace."

## "Stronger than ever"

Firefly is on sound financial footing after the ups-and-downs of the last two years. Noosphere Ventures is providing all the capital the company currently needs, Markusic said, but didn't give a specific dollar amount. Max Polyakov, the founder of Noosphere Ventures, has committed to funding the company through the first Alpha launch.

"That's really beneficial, because it allows me to spend a lot less time thinking about the financials and the fundraising and more time with our young team in the field, getting this hardware ready for first flight," he said. The company will look to raise outside capital for future growth, including development of Beta.

"Firefly is back in full force," says Tom Markusic, the company's chief executive.

The company's Texas facilities have about 140 employees now, close to the size of the original Firefly when it ran into financial problems two years ago, and the company is actively hiring. The company recently opened an office in Ukraine with about 30 people that will do some engineering and design work as well.

In Texas, about half of the current employees worked for the earlier Firefly. "These are some real adventurers," he said of them. "Having gone through that pain and coming back, I think, speaks a lot to their dedication. Those people are really forming the core, the backbone of this new company."

"We've got a lot to do in the next year, but we're really on track," he said near the end of the interview. He sounded a little tired, and acknowledged that he was.

"That tired sound is not from being discouraged. It's just there's so much to do," he said. "I feel very blessed and fortunate, given what we've been through. We're stronger than ever in every respect." SN