Paul Allen's giant plane takes shape in the desert, but its market is unclear

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In the high Mojave Desert, the airframe of Paul Allen's giant, mysterious plane for carrying rockets into space is approaching completion.

It has twin fuselages, 95 feet apart, that are joined across the top by a massive wing, 385 feet from tip to tip - longer than a football field including the end zones.

With a larger wingspan than any aircraft ever built, the six-engined plane - officially called Stratolaunch - has been nicknamed the Roc, after a mythical Middle Eastern bird so big it could carry an elephant in its claws.

Ahead of a major space-industry conference this week in Seattle, Allen's Vulcan Aerospace last week opened up the secretive assembly plant to a small group of journalists, among other things letting them walk across that massive wing.

The visit suggests that the challenge for Allen's ambitious project is not whether his plane will fly, but whether his business plan will.

Vulcan's concept is that this airplane will carry a rocket weighing up to 275 tons slung beneath the central part of the wing - between the two fuselages - and release it at 35,000 feet. The rocket will then launch into space and deliver satellites into orbit.

Unlike today's massive Atlas and Delta rockets that launch vertically from Earth, the Roc will be able to land, load up and take off again, making space access easier and cheaper. It's supposed to be more like a routine airport operation than a big Cape Canaveral-style deal.

"When such access to space is routine, innovation will accelerate in ways beyond what we can currently imagine," Allen said in an emailed statement.

Yet this first close-up look at the great beast elicited not so much a wow response, more a "what the heck?" The plane is awesomely big but also tremendously odd-looking.

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Strange enough is the basic twin-fuselage, single-wing concept, which gives it the overall look of a pair of insects conjoined at the wing and enlarged to the size of a dinosaur.

Stranger still is the shape of the fuselages, each individually looking like a mythical hybrid beast that morphs from boxy at one end to sleek at the other.

This is the fanciful work of Scaled Composites, the innovative experimental aircraft firm founded by Burt Rutan that has designed and built the airplane and will fly it for Allen's Vulcan Aerospace.

Any jet airliner you've ever flown in has a round fuselage, eschewing corners that could become points of excess pressure. But because the Roc's aft fuselages are largely empty and unpressurized, the engineers of Scaled Composites went with a simpler-to-build boxy body at the back, rectangular in cross-section.

In the middle of the airplane, its body thickens considerably where it's topped by the wing, to create clearance for the rocket slung under the wing's center span.

The forward end of each fuselage is round, because it's pressurized, and a long drooping neck tapers to a Boeing 747 cockpit, so that it resembles a dinosaur dipping to feed.

The three-person crew - pilot, co-pilot and flight engineer - will sit in a cockpit in the right-hand fuselage, maneuvering the plane from far to the right of the centerline.

The left-hand fuselage has what looks from outside like a cockpit with windows, but it's empty and unpressurized.

The crew will enter the cockpit through an oval door that's less than 5 feet tall, as if sized for a hobbit. It's clear this vehicle is designed to carry test pilots, not passengers.

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The crew's flight deck is literally that of a 747.

Allen bought two used jumbo jets formerly flown by United Airlines and cannibalized them for parts that account for about half the empty weight of the Roc.

So although the shell of the cockpit and all the rest of the plane's body is new - hand-built by Scaled Composites from carbon fiber composites - various key pieces and systems, including avionics, hydraulics and fuel subsystems, are salvaged 747 parts. BAE Systems was subcontracted to disassemble the 747 and install its systems on the Roc.

The cockpit seats look old and used because they are. The seats as well as the controls the crew will manipulate and the windows they'll look out of all came from the 747s.

So did the plane's six Pratt & Whitney engines, which are already refurbished, cleaned, wrapped and set aside in a corner, ready to hang on the airframe when it's finished.

The pods around those engines, the 747 nacelles, and the pylons they will hang from are also ready.

Last week, workers were busy completing the struts that will cantilever the engines far out ahead of the wing and installing the connections that will link the engines to the airplane's control systems.

The plane will have six sets of 747 main landing gear, each with four wheels, and two sets of 747 nose landing gear, each with two wheels.

Yet the overall look is nothing like a 747.

At the ends of the immense wings are very un-Boeing-like winglets, fins that could have come off a 1960 Cadillac Coupe de Ville.

No doubt they weren't put there just to look different and cool, but they do.

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There's little doubt that the Roc will fly.

Scaled Composites, which has 300 people working on the project, has a successful enough track record. For example, it built the much smaller but also dual-hulled White Knight Two, the mothership used to launch a small suborbital vehicle.

Virgin Galactic plans to use White Knight Two to take tourists briefly to the edge of space.

And Scaled Composites has clearly been painstaking in building the Roc.

With a rocket attached, the aircraft will weigh 1.3 million pounds, equal to the fully loaded weight of the world's largest civil airliner, the Airbus A380 double-decker jet that carries about 550 passengers.

Janicki Industries of Sedro-Woolley, Wash., a leading maker of composite tooling and parts, made about 40 percent of the Roc's composite structure and trucked the pieces to Mojave.

Janicki also supplied huge fiberglass molds used in the Mojave facility to shape and fabricate large structural pieces such as the vertical tail.

Unlike the highly automated manufacturing of Boeing's 787, where robotic heads lay down strips of carbon fiber tape that is then baked to hardness in a huge pressurized oven, the composite pieces of Allen's one-off airplane are handbuilt.

Next to the 100,000-square-foot assembly building, T-shaped to accommodate the massive wings, is a separate, similarly sized fabrication facility, where Scaled Composites made such challenging carbon fiber parts as the jet's 250-foot

long single-piece wing spars.

Last week, two young women in a cold room there cut composite fabric and applied it by hand onto molds to fabricate some of the few parts still to be made.

Nearby, two young guys installed actuators that move the rudder on the right tail, the last piece of the airframe still to go on.

Inside the assembly building, the nearly completed airframe sat raised up on hefty metal stands, missing only that tail, its engines and its landing gear.

Atop the structure, workers used vacuum bags and applied heat to bond strengthening strips of composite on various pieces of the Roc's skin.

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What's unclear is whether Stratolaunch will ever succeed as a business so that the Roc gets to fly more than a few times.

Since Allen first announced his project in Seattle in 2011, the business plan has changed several times, losing key partners along the way.

Originally, Elon Musk's SpaceX was going to provide the launch rocket fitted beneath the Roc. SpaceX pulled out, to be replaced by Orbital ATK, which then also dropped out.

The first goal of Stratolaunch has been to launch satellites into orbit.

But at one point, Sierra Nevada, the Sparks, Nev.-based builder of a space vehicle called Dream Chaser, was invited to build a smaller version of that vehicle to fit under the Roc for potential human spaceflight. That plan, too, was shelved indefinitely.

In the meantime, Musk's SpaceX and Jeff Bezos's Blue Origin have successfully pioneered new reusable ground-launched rockets that are already dramatically lowering the cost of access to space.

And even the satellite-launch business has changed radically in the five years since Stratolaunch began.

Now there are multiple startups interested in finding new applications for satellites, boosting demand for launch vehicles.

But the demand has shifted mostly toward small, even tiny satellites going to low earth orbit, not the huge, minivan-sized satellites that used to be standard.

As a result, there are also new startups chasing new, even cheaper ways to launch these small satellites. Among them are Firefly, based in Cedar Park, Texas, and Los Angeles-based Rocket Lab, founded by New Zealander Peter Beck.

Paul Allen, in his emailed statement, compared this new wave of interest in space to the introduction of personal computers, the advent of the web and the proliferation of smartphones.

Greatly expanded access to low earth orbit "holds similar revolutionary potential," Allen wrote.

Yet some consider that the Stratolaunch may be overbuilt for this new world of smaller-scale satellites.

Vulcan Aerospace president Chuck Beames said the large size of the Roc provides Stratolauch the flexibility to carry all loads, big or small, ensuring success however the market shifts.

However, in a briefing in Mojave, he provided no details of any new partners or contracts. He said many deals are in the works but cannot be talked about yet.

Adam Bruckner, professor of aeronautics and astronautics at the University of Washington, said Vulcan's lack of transparency makes it difficult to assess Stratolaunch's future.

Although launching a rocket from the air is an interesting idea, miniaturization of satellites has changed the technology requirements in ways that could leave the Roc stranded, Bruckner said.

"They've developed this behemoth launch system and the market is changing under them," he said. "I would not use this launch system if I was launching a handful of cubesats, which are very small."

Despite the progress in Mojave, it's clear there's a long way to go before the Roc can roll out of the assembly building complete.

When the airframe is done, all the electrical, pneumatic and hydraulic systems must be installed.

And once it rolls out, it could take nearly a year of ground tests before it would fly.

Stratolaunch officials said assembly is about 76 percent complete.

A reporter suggested to Beames that a rollout this year looks unlikely given the current state of the project. That would push out the first flight to late next year.

"You'll be pleasantly surprised," Beames responded, adding that "there's no pressure to bring this thing on line ... until it's done correctly."

Though Allen's virtually bottomless purse is funding the project now, by the time the plane flies, Stratolaunch will need a solid business plan to keep going.

Allen won't want to emulate Howard Hughes, who in 1947 flew his eight-engined, 320-foot wingspan Spruce Goose on its first flight - which lasted about a mile at just 70 feet above the water.

It never flew again, and the Spruce Goose became a famous white elephant.