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KEN'S TOP 10 FAQs

HELIX

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THESE ARE MY TOP 10 FAQs

They're questions I love to answer, because they tell me what's on people's minds. They get to the heart of the Helix and give me an opportunity to talk about Pivotal's purpose, what makes our eVTOL aircraft safe, and how our aircraft are different from other eVTOLs. Have a read.

Ken Karklin, Pivotal CEO ⇲

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1 WHY DO YOUR CUSTOMERS FLY THE HELIX?

MY ANSWER DEPENDS on the type of Pivotal customer we're talking about. On our website today, almost all of what you see is aimed at consumers who fly our aircraft for recreation and short-hop travel. They're seeking adventure and the opportunity to own an entirely new type of aircraft. They're classic early adopters, intrigued by innovation and technology. Many have a lifelong interest in aviation, though less than a third hold pilot's licenses.

What you may not know is that, in the background, Pivotal is also working with Public Safety and Defense customers on missions that use the Helix to save and protect lives in medical emergencies and in military situations where the Helix can outperform alternative options for transportation.

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2 WHERE CAN YOU FLY AN AIRCRAFT LIKE THE HELIX?

AS AN ULTRALIGHT AIRCRAFT as designated by the FAA, the Helix can be flown over uncongested areas only. This means you should not be flying over assemblies of people, occupied buildings, cities, settlements, or similar locations that could reasonably be considered “congested” with people. In the US, Federal Aviation Regulations pertaining to Ultralights, commonly known as FAA Part 103, limit operation to flying in uncongested areas only.

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3 SO, THE TERM “UNCONGESTED” DESCRIBES THE LAND YOU FLY OVER, BUT WHAT ABOUT THE AIRSPACE?

FAA PART 103 REGULATIONS limit operation of any ultralight to flight in Class G (uncontrolled) airspace. With authorization from the responsible Air Traffic Control (ATC) facility, pilots may be permitted to fly an ultralight in other classes of controlled airspace, although ATC may impose requirements and limitations.

We’ve experienced requirements from ATC, including use of an onboard aviation radio and/or an ADS-B transponder when transiting Class B, C and D airspace. Both are optional equipment with the Helix. Most airspace in the United States is classified as G or uncontrolled airspace, especially at lower altitudes and away from large cities and large airports.

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4 JUST HOW HIGH CAN YOU FLY A HELIX?

(PART 1: AGL)

THIS IS ACTUALLY TWO QUESTIONS IN ONE. Let's start with Part 1: In aviation terms, we're talking about altitude described as Above Ground Level or AGL.

Assuming generally-level terrain, we train our pilots to operate in cruise flight at an altitude near 250' AGL and generally not higher than 400' AGL. This way, you're close enough to the ground to admire the view and don't consume a lot of energy ascending or descending, yet you are high enough to have margin and reaction time in the event of an emergency deployment of the ballistic parachute.

About that parachute: in 1000s of flights, none of our pilots or customers has deployed the parachute, except when Pivotal was testing the parachute and deploying it deliberately to verify performance across a range of conditions.

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5 JUST HOW HIGH CAN YOU FLY A HELIX?

(PART 2: MSL)

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LET'S CONTINUE WITH PART 2:
How high can you fly a Helix in terms of altitude above sea level?

How high you fly a Helix in terms of absolute altitude above sea level (as measured by Mean Sea Level or MSL) is a function of several factors. As you ascend from sea level and into the mountains and high plains, the air gets less dense: it weighs less per unit of volume. To get the same flight performance, including lift from the wings in forward flight and thrust from the propellers, the props must rotate proportionally faster, moving more cubic feet of air in order to move the same *mass* of air.

The aerodynamics of forward flight at a higher MSL means the aircraft flies faster over the ground to reach the same measured airspeed value and same lift.

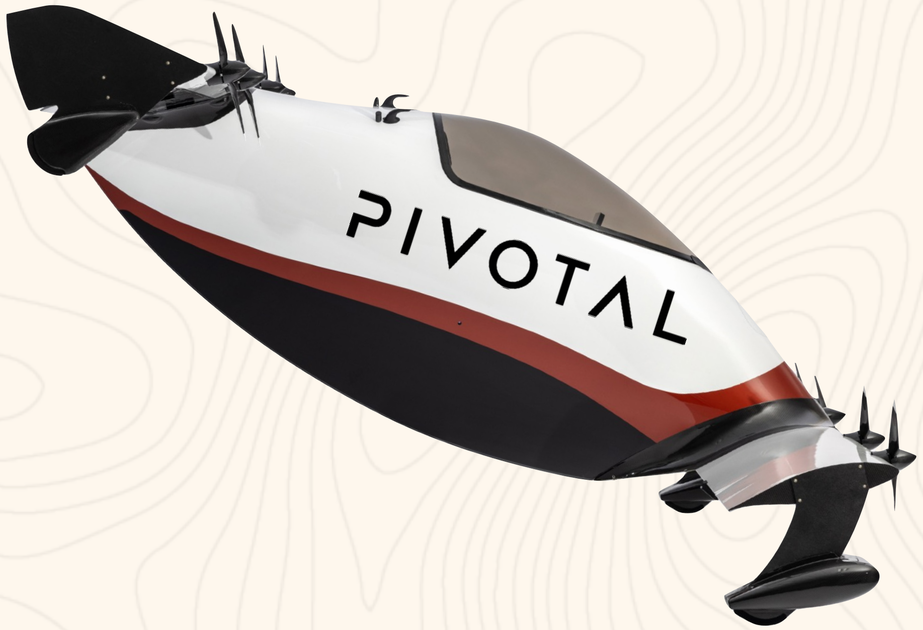
Temperature also plays a big role. The cooler the air, the more dense it is. At higher temperatures, the air is less dense.

Finally, the barometric pressure, which fluctuates with weather, also plays a small role. All of these variables are used to calculate the dry-air **density altitude**.

The Helix service ceiling is limited to 10,000' density altitude (or DA). This won't be too much of a concern unless you hope to operate at moderate-to-higher altitudes (say, above 4000' MSL). If that is the case, then watching the temperature becomes more important.

Now you can see why, when someone asks me how high can you fly the Helix, I ask: got a minute?

6 WHY DID YOU CHOOSE TO BUILD AN ULTRALIGHT AIRCRAFT?



WHEN PIVOTAL STARTED UP IN 2009, we saw and continue to see major advantages to designing and building an eVTOL as an FAA Part 103 (ultralight) aircraft.

First is our ability to bring a product to market without the dependency of FAA type certification, which continues to be undefined and a challenge to attain. With no applicable standard in place and in force of law, we'd still be waiting to ship or fly our first aircraft. In the commercial space, powered lift eVTOL companies pursuing air taxi business plans have spent billions on ad hoc certification schemes negotiated with the FAA over a period of years and have staffed their companies with hundreds of engineers. They have yet to fly more than a few transitioning flights with human pilots that utilize both hover and forward flight.

In the coming year or two, Pivotal will have a path to certification for a larger eVTOL aircraft variant of Helix, when the MOSAIC proposed rule making comes into force. This will create a "light sport aircraft" path to certification for craft like the Pivotal Helix, but larger (at least two people). In the meantime, Pivotal has chosen a leaner, more agile path with our light eVTOL to safely participate in this formative market.

We are learning every day what our customers want and need, incorporating our learning into the Helix production aircraft design. Early market entry means we're years ahead of our competition in assessing product-market fit.

7 HOW DO PIVOTAL AIRCRAFT COMPARE WITH AIR TAXIS LIKE JOBY, ARCHER, AND BETA?

MAKERS OF LARGER eVTOLs like Joby, Archer, and Beta are focused on multi-passenger commercial carriage with longer range aircraft serving as air taxis for urban air mobility.

Clearly, their business strategy is far different from ours, though we share a common interest in exploiting the unique characteristics of aircraft that are smarter, cleaner, quieter, and need no runway.

8 WHY BUILD AN AIRCRAFT THAT CAN ONLY FLY 20 MILES?

THE SHORT ANSWER: because it remains both useful and really fun to fly—and to learn about eVTOLs as fast as we can. By taking the ultralight path, we've limited the maximum weight of the aircraft to 254 pounds (plus allowances for certain safety devices and features). We incorporate two key safety features: 1) a ballistic parachute, and 2) floats on the wings in case of an emergency water landing, giving us a maximum total empty weight of 348 pounds.

As a result, we carefully design every gram of the aircraft to support built-in safety. We continually make tradeoffs in the weight budget between battery power and every component of the system architecture, including propulsion, control surfaces, cabling, fuselage, and flight panel, to name a few.

At current levels of battery energy density, weight limits directly correlate with range and duration limitations. Naturally, as energy density continues to increase, so will our range and duration.

9 WHAT IS UNIQUE ABOUT THE HELIX?

EVTOL IS A CATEGORY OF AIRCRAFT that uses electric propulsion and is capable of vertical takeoff and landing.

In the most basic sense, a two-pound DJI drone with its four electric propellers is an eVTOL. eVTOLs include helicopters, multicopters, and a variety of winged aircraft that derive most of the lift in forward flight from the wings. In vertical or hover flight all of these aircraft are propelled entirely by engine thrust.

These winged aircraft additionally fall into a category called **powered lift aircraft**, and are VTOLs. The category includes such venerable aircraft as the Harrier Jump Jet and the V-22 Osprey. They all fly largely like traditional winged aircraft in forward flight. Pivotal aircraft are included in the powered lift group.

For takeoff and landing the props need to face upwards for powered lift. There are three principal ways to make this happen—tilt the props themselves (tilt rotor), tilt the wings that the props are attached to (tilt wing), or, in our case, **tilt aircraft**, in which the entire aircraft pivots in order to direct thrust. For anyone who has seen a Pivotal aircraft take off and land, you know which of the three the Helix is: tilt aircraft.

On takeoff, the whole aircraft rotates so the propellers are facing upwards, giving the aircraft lift during the hover flight mode. Once airborne, the aircraft transitions to cruise mode by tilting downward, so the propellers are facing forward and Helix's dual wings provide lift. The reverse happens on landing.

The Helix is unique among eVTOLs today. Our tilt aircraft are simpler, safer, and more efficient than tilt-rotor or tilt-wing eVTOLs, where the propellers or wings themselves position the rotors horizontally to produce lift on takeoff and landing, then rotate for forward flight. For more detail about our tilt aircraft design, see our Introduction to Tilt Aircraft here.

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10 IS THE HELIX A FLYING CAR?

This is one of my favorite questions. On literal grounds, I'd have to answer "no." The Helix doesn't drive on roads, then take off when the driver wants to go airborne. That said, the phrase *flying car* is so popular and frequently used to apply to eVTOLs (not just the Helix) that I've stopped correcting people who use the phrase, including journalists from the top media outlets. It's no use fighting City Hall.

As and when makers of actual flying cars attempt to introduce their products to the market, the distinction between their literal flying cars and eVTOL aircraft will become more apparent. Life is short, so I'll avoid being the language police and move on. I'd rather be flying!

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LET ME KNOW WHAT YOU THINK ABOUT MY TOP 10 LIST

FEEDBACK@PIVOTAL.AERO

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