



Press Kit

Summary

Overair is positioned to be a global leader in all-electric aerial mobility. Overair's electric vertical takeoff and landing (eVTOL) aircraft, Butterfly, is designed based on decades of advanced rotorcraft development with stakeholders such as the US DoD and NASA to produce the most advanced flight vehicles in the world. Butterfly applies this knowledge and technology to the commercial market, providing the right vehicle for advanced aerial mobility (AAM).

Butterfly is a fundamentally different type of aircraft – it is a transportation system optimized for safety, passenger experience, and economic productivity. Butterfly is designed to be a mobility workhorse, offering superior safety, noise, utilization, and operator economics. Think down-sized military transport, not an up-sized drone.

A smaller, cleaner place for everyone

Overair's vision is to make the world a smaller, cleaner place for everyone. We are a team of innovators, engineers, aviators, designers, and entrepreneurs unlocking a new market for people's time.

Freedom from daily constraints

Overair creates opportunities for all, removing the time and distance hurdles imposed by today's two-dimensional transportation options. Butterfly sets new standards for safety, rider value, commercial viability, and public acceptance for aerial mobility. A five-passenger aircraft uniquely capable, safe, quiet, fast, and affordable to ride and operate, Butterfly will democratize aerial mobility, sustainably connecting people and places.

We have changed aviation before

Overair spun out of Karem Aircraft and is the fourth in a series of companies founded by Abe Karem. Each of Karem's companies has expanded the bounds of the aeronautical technology landscape, seeking greater aircraft performance and higher levels of efficiency and safety. Today, Overair draws from that experience base, accumulated over four decades.

Karem is often cited as the founding father of the "age of drones." In the 1980s, starting in his garage in Southern California, Karem's first team developed aircraft systems that evolved into the Predator unmanned aerial vehicle, which has been deployed around the world and rewrote the book on how aircraft are used in military operations. Since then, Abe's teams have populated the skies over the Mojave Desert with a wide range of innovative fixed-wing and rotary-wing aircraft. For example, the A160 Hummingbird broke endurance and altitude records for its class of aircraft and initiated the technology path leading to Butterfly's high-efficiency propulsion system.

We have a vision for the future of aviation

Butterfly is the culmination of over 20 years of VTOL propulsion development, guided by a passion to continue improving vertical flight. These efforts led to a new class of propulsion technology – Optimum Speed Propulsion (OSP). This proprietary VTOL technology underpins Butterfly and allows for highly efficient operation across all flight regimes – safer and quieter than helicopters in vertical flight and as efficient as fixed-wing airplanes in forward flight. These are crucial attributes in aviation's transition to electric powerplants.

Butterfly, Overair's solution to the advanced air mobility market, is designed for the rider. The aircraft integrates dozens of patented technologies, which together represent a paradigm shift in safety, noise, utilization, and operator economics for vertical flight aircraft.

History

Hanwha Systems – Strategic Partner

Hanwha Group is the seventh-largest company in Korea, with a clear plan to become a global leader in urban air mobility. In connection with Overair's spinoff from Karem Aircraft, Hanwha led Overair's Series A financing with a \$25 million equity investment. Hanwha is also a strong technical contributor to Butterfly's development, with highly talented engineers working alongside the Overair team in Santa Ana, California.

Karem Aircraft – Initial Design

Overair spun out of Karem Aircraft in January 2020. Karem Aircraft fulfills US military contracts, which have included the Army's Joint Heavy Lift, Joint Future Theater Lift, Joint Multi-Role, and Future Attack Reconnaissance Aircraft programs. Its founder, Abe Karem, is referred to as the "Dronefather," having designed the Predator unmanned aerial vehicle (acquired by General Atomics), which rewrote the military aerial playbook, and the A160 Hummingbird (acquired by Boeing), which set rotorcraft endurance records.

Success with Optimum Speed Propulsion (OSP) and other vertical takeoff and landing (VTOL) technologies for military applications gave Karem Aircraft a strategic advantage in designing and manufacturing a world-class electric VTOL aircraft. In January 2020, after completing Butterfly's initial design and partnering with Uber Elevate, Karem Aircraft spun off Overair to focus on the commercialization of Butterfly for civilian advanced air mobility. Today, Overair carries the torch with the IP, engineering, and commercial prowess to launch Butterfly as the most advanced eVTOL platform.

Proprietary Propulsion Technology

Butterfly's cutting-edge propulsion system drives unique performance advantages in energy efficiency and noise reduction. To safely transport riders in dense, urban locations, the aircraft must feature a robust flight envelope with excess margins and must take off vertically without disrupting the surrounding community. While gas turbine-powered helicopters typically have sufficient power, their acoustic signatures and safety levels are incompatible with high-density operations in cities.

The amount of power required for an aircraft to hover depends on the total disk area of the propulsors used to generate the thrust. Large rotors require less power than small rotors because they move more air. Ordinary helicopters employ a single, large rotor because this is the simplest arrangement that maximizes disk area for fixed vehicle size and therefore minimizes the power required for hover. However, helicopter rotors are less beneficial in forward flight, experiencing high loads and vibrations and becoming less efficient at higher speeds. Furthermore, single rotor helicopters lack the propulsion redundancy to satisfy safety expectations for dense urban operations.

Many of the aircraft designs competing with Butterfly distribute numerous small propellers on the wings and tails, some with props that tilt forward in cruise and others with separate props for hover and cruise. Such small propellers experience strong vibrations as they transition from hover to cruise, but because of their small size, they can tolerate the associated high loads. However, small propellers demand very high-power in hover, so they typically can only hover very briefly.

Butterfly uses four large, electric propulsors, maximizing disk area for a multi-prop aircraft and providing ample propulsive redundancy. The large disk area reduces power demand to the extent that hover requires only a small fraction of the vehicle's installed power, leaving large margins available to operate safely in a wide range of challenging environments. Each propulsor incorporates significant fault tolerance so it can continue providing power even in the extremely unlikely event of multiple component failures. Notably, Butterfly can continue to fly safely and conduct hover landings with a propulsor completely shut down.

When Butterfly's props tilt to transition between hover and cruise, Overair proprietary technology eliminates the high vibrations and loads that would occur in other eVTOL systems.

Butterfly is quieter than any other eVTOL. Not only are Butterfly's propellers larger in diameter than typical eVTOL aircraft, but its total blade area is also greater, which allows Butterfly's propellers to spin at slower speeds than typical helicopter rotors or any other eVTOL. Large blade area and slow spin speed minimize the pressure

disturbances propagating from the system. What little noise is produced by Butterfly's propellers is transmitted at a frequency at which the human ear is very insensitive.

Advanced Design

We designed Butterfly to be the practical choice for electric urban air mobility. We may not be the first to market, but we will commercialize the leading eVTOL in the long run. Here are ten reasons why:

Optimum Speed Propulsion: high efficiency through all flight regimes and quietest eVTOL on the market

Advanced carbon fiber composite structure: damage tolerant and lightweight, using next-generation material systems

Interconnected batteries in nacelles: away from occupants and easily accessible for maintenance, redundant power supply

Shaped blade tips: aerodynamic efficiency and low noise

Low disk-loading propellers: highly efficient hover and excess power margins

Vectored thrust configuration: combined efficiency in both hover and cruise

Redundant propulsion system: safe flight and hover to land in all credible component failure combinations, including the extremely unlikely scenario of single or, in some cases, double engine failure

Fly-by-Wire flight control system: full-authority envelope protection and human error mitigation

Connected vehicle health and usage monitoring and real-time diagnostics: reduced maintenance costs, maximum safety, and utilization

Butterfly's Competitive Edge

Butterfly's large rotor disk area means it takes less power to fly, giving Butterfly excess capability. This excess delivers unrivaled advantages to our customers in the form of safety, noise, utilization, and operator economics.

Safety

- Large lift, power, and controllability margins in hover, cruise, and transition
- Ability to fly with one (and in some cases two) propellers inoperative
- Redundancy in flight-critical systems
- Simplified vehicle operations (SVO) for reduced pilot workload

Noise

- Low disk loading, low propeller inflow (55dBA hover, 30dBA cruise – acoustic estimates at 100 meters and 500 meters, respectively)
- Shaped blade tips operate at low speed
- The sound frequency is at the low point of human sensitivity

Utilization

- Robust design for safety margins in all conditions, including safe transition in gusts
- Power efficiency yields a path to all-weather operations to ensure high service uptime for riders to depend on
- Mission capability provides broad route availability to riders

Operator Economics

- All-electric powertrain paired with Overair's propulsion innovations enabling superior efficiency
- High speed/low charge times
- Low maintenance cost and mechanical simplicity enables high vehicle uptime and utilization, increasing operator margins and passing value on to riders

Key Stats

Overair

- 100+ years of combined aerospace engineering and management experience
- 20+ years of VTOL propulsion development
- \$150 million of military and private funding of technology development
- 14 novel aircraft designed and flown by Co-Founder and Chief Designer, Abe Karem

Butterfly

- 0 carbon emissions in flight
- Ability to fly in broadest types of weather conditions provides dependable route availability
- Noise signature at low point of human hearing range
- 200 mph top speed
- 100+ miles range
- 5 passengers plus cargo
- 2-3x redundant flight control system
- 2025 path to FAA certification

Download Butterfly assets [here](#).