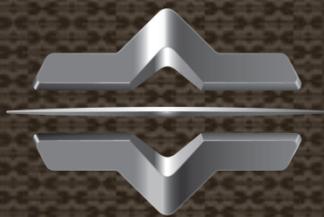


PAL-V

PRESS FOLDER



a joy to drive, a joy to fly

Flying Car, PAL-V, First In The World To Finalize Certification Basis With EASA

After being the first flying car to get road permission for Europe, PAL-V is now also the first to complete the full certification basis with EASA. Based on PAL-V's 10 years of test results, EASA specialist teams finalized the requirements for the PAL-V Liberty. The issuance last week, after industry consultation, shows the confidence of the European authorities and the maturity of the design and the company. The final phase is compliance demonstration before CarFlying becomes reality for PAL-V's customers.

"Getting a flying car to the market is hard. It takes at least 10 years", said Robert Dingemans, PAL-V's CEO: "Although we are experienced entrepreneurs, we learned that in aviation everything is exponentially stricter. Next to the aircraft, all aspects of the organization, including suppliers and maintenance parties must be certified."

In 2009, PAL-V agreed with EASA (European Union Aviation Safety Agency) to use the Certification Specifications for Small Rotorcraft, CS-27, as a starting point for the development of the Certification Basis. PAL-V worked together with EASA to amend the complete list of over 1,500 criteria to make it applicable for the PAL-V. The list was published last year for review by industry experts and the final version was published last week.

CTO, Mike Stekelenburg: "Safety is key in developing the Liberty, we are privileged to work with top experts of EASA. Their high safety standards also allow the Liberty to be used professionally. From the start, we built the Liberty to comply with existing regulations. This strategy provides the fastest route to market."

PAL-V Head of Airworthiness, Cees Borsboom: "I'm proud to see the results of our work. We can now speed up the completion of the compliance demonstration phase. It's hard to grasp the amount of work required to certify an aircraft. The sign-off of 1,500 requirements already in 2012, before starting manned test flights, was the beginning. The development of the requirements started in 2009. More than 10 years of analysis, test data, flight tests, and drive tests, led to this important milestone. In parallel, we already started compliance demonstration to obtain the type certificate, which will be followed by delivery of vehicles to our customers."

The EASA type certificate is valid for Europe and is also accepted in 80% of the world market, including the US and China.

Publication: <https://www.easa.europa.eu/document-library/product-certification-consultations/special-conditions-gyroplane-combined-road>

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Background information, About PAL-V

PAL-V International B.V., the company that initiated the development of the PAL-V, is located in Raamsdonksveer, The Netherlands. The company was founded in 2007 to commercialize the concept developed since 1999. The management consists of a team of experienced Dutch entrepreneurs with expertise in aviation, automotive, research, and marketing. PAL-V succeeded in gathering the best talent available. Testing its "proof of concept" vehicle for driving in 2008/2009 and for flying and driving in 2011/2012, it has proven technical feasibility and certifiability within the existing regulatory framework. The company is funded by a group of professional and private investors and also received funding from the Dutch Ministry of Economic Affairs. Three Dutch ministries are supporting the project based on its technical innovation and economic potential.

Questions



Answers

Can you tell more about the engine solution?

The dual-engine propulsion drive train is based on two fully certified airplane engines from Rotax, one of the leading manufacturers in aviation engines.

What about safety?

The PAL-V LIBERTY has been developed by using proven state-of-the-art technologies from the aerospace and automotive industries. In the air, the underlying gyroplane technology guarantees a stable flying platform that supports safe landing even in the very unlikely event of a total power failure. Which in itself is very unlikely thanks to its unique two-engine propulsion solution.

A gyroplane as such is already a very safe way of flying. However, by a rigid focus on flight safety PAL-V has taken it to the next level. By making small compromises on the specification we created the safest gyroplane ever built.

Unlike most small airplanes and gyroplanes the PAL-V LIBERTY will be certified under the very strict safety regime of EASA (Europe) and FAA (USA). Many countries in the world follow the same rules. On the road, the PAL-V LIBERTY is complying with the applicable road safety requirements.

An inherent safety aspect is that in case of bad weather conditions you can drive (part of) your journey. This does make your planning much more certain but also increases your safety options dramatically.

Will regulators allow the use of PAL-Vs?

The PAL-V LIBERTY is designed within the current certification and regulations frameworks for the vast majority of countries in the world. No rules or regulations need to be changed to be allowed to use the vehicle.

What market does PAL-V aim for with the Liberty?

PAL-V distinguishes two markets in personal flying mobility, urban mobility, and Town-to-City mobility or Regional Mobility. At this moment PAL-V aims for Town-to-City mobility, where you take-off outside a town, land in front of another town or city and drive into the city to the destination.

Why start with the town-to-city market?

There are a few reasons why PAL-V deliberately choose for Town-to-City mobility. One of them is that there is no need for additional infrastructure to support a vehicle like the PAL-V. Because the PAL-V can be fueled up at any gas station and you can park your PAL-V in your garage there is no need for a hangar or fuel station at the airstrip. The PAL-V only needs a grass strip to land or take-off, which is abundantly available and often can be created easily. Because the PAL-V complies with existing regulations it is also allowed to land at normal airstrips or airfields. Another reason is that there is no need to change any regulations to the PAL-V to open up the Town-to-City mobility, which makes the PAL-V a viable flying car without barriers.

Why not urban mobility?

We are convinced that there will be a market for urban mobility. However, not for this decade. Some major challenges need to be addressed. One of them is the noise that aircraft make. The



PAL-V is relatively quiet compared to helicopters but it still produces propeller noise. Although you might think that electric engines would resolve that issue, it doesn't. The main source of noise pollution comes from the blades of the rotor and propeller, especially when using drone or helicopter technology. The other challenge is the level of safety required to fly over urban areas. On top, new regulations have to be put in place and the infrastructure needs to be created such as vertiports and traffic management. It's also very expensive to train commercial pilots. McKinsey identified infrastructure investments and pilot training as the biggest hurdles for the urban mobility market.

What specs does it have?

Please view:

<https://www.pal-v.com/en/explore-pal-v>

Why is the gyroplane concept chosen?

Safety first: in case of engine failure, the gyroplane can be landed normally in a very small area equivalent to a tennis court. Landing without an engine can be done with +/- 30 km/h (18mph) ground speed on a very small spot (30 meters or 100ft). This makes emergency landing, in combination with the unique double redundant drive train of the PAL-V LIBERTY, multiple times safer than a comparable aircraft or helicopter.

Advantages compared to a conventional airplane:

Safety again: contrary to fixed-wing airplanes, gyroplanes cannot stall and crosswind landings are easier and safer than with a fixed-wing airplane.

Convenience and comfort: in turbulent air, it still flies smoothly with excellent stability due to its high rotor speed. You will only experience 20% of the turbulence of a comparable fixed-wing aircraft.

Versatility: Because a gyroplane can fly very slowly, it needs very little space to land. Take-off distance ranges from only 90m to 200m (300ft-650ft). As it deals much better with turbulence and cross-wind you can safely fly a PAL-V LIBERTY while fixed-wing airplanes have to stay on the ground.

Fun and effectiveness: wide speed range, with a low minimum horizontal speed (from 50 km/h up to 180 km/h or 30mph-112mph). The PAL-V LIBERTY exhibits very positive slow flight envelope characteristics, even slow glides are possible up to safe vertical descends.

Advantages compared to a helicopter:

Safety and ease of operation: a gyroplane is very easy and safe to fly because it is a stable mechanical system. A comparable helicopter is the opposite: this is an unstable system, kept in the air by the skills of the pilot using both hand and feet. A helicopter is much harder to fly and therefore much riskier and challenging to operate.

Versatility: unlike a helicopter, a gyroplane cannot take off or land vertically. Although you may think this to be an important limitation, in practice it is NOT thanks to the driving capability of the PAL-V LIBERTY. Since you can drive the PAL-V LIBERTY to your destination, it is much more useful and versatile even than a helicopter: taking off nearby is good enough and it does not require anybody to stay behind to guard your aircraft at the landing spot. Also landing a helicopter at the spots where you would like to land is very often not allowed or possible because of noise and safety, making helicopter use in practice very cumbersome. Therefore helicopters are not as practical and useful as a PAL-V LIBERTY.

Cheaper to own and operate: a PAL-V Gyroplane has a significant lower cost of ownership compared



to a helicopter, yet can accomplish most missions that a helicopter can plus other ones. Since you park it in your garage, costly hangar space is not required.

What happens when more PAL-Vs take to the sky?

The great news is that because PAL-V is designed within today's existing regulatory framework, all the tools are in place for safe management of transportation in the sky including 2nd Generation air traffic control. Rules and regulations are in place under the International Civil Aviation Organization (ICAO) to allow the use of the first PAL-V LIBERTYs.

Is it possible to take off and land everywhere?

No, just like any helicopter or air-taxi drone. Apart from the fact that this is not allowed by law, the PAL-V needs a space for take-off measuring about 90-200 by 20 meters (300ft-650ft by 65ft) without surrounding obstacles. In practice, all small airstrips, aerodromes, glider sites and/or ultralight airfields will suffice. The PAL-V LIBERTY can operate from either concrete or grass airstrips. As the PAL-V popularity increases, it is expected that more and more small uncontrolled airstrips will be created. Many countries also allow for special permits on private property.

Do people need a license to fly the PAL-V?

Yes, they certainly do need a license to fly. This can be obtained through one of the many flight schools in the world. To be able to operate an airplane you will need some basic knowledge of navigation, instruments, meteorology, aerodynamics and performance. All pilots of aircraft need training and the PAL-V LIBERTY is – for the aviation aspect – no exception. To acquire a license people have to pass a theoretical exam and have a reasonable

amount of training first with an instructor and later as a single pilot (solo) to learn to fly a gyroplane. The gyroplane license can usually be obtained within 30 to 45 hours of training, depending on skill and talent.

Will such a “flying car” receive certification for road and sky?

The PAL-V LIBERTY is designed within existing certification requirements on the road as well as in the sky. For flying, CS-27 (Europe) and FAR-27 (USA) are the standards on which the Type Certificate is based. For driving, the road legislation directives of the European Commission and National Highway Transportation Safety Administration (NHTSA) standards are used. The PAL-V ONE "proof of concept" prototype confirmed that the PAL-V LIBERTY can be built to meet these standards without exemptions. In October 2020 the PAL-V Liberty received road admission for Europe and a number of countries outside Europe. The Liberty is driving with official license plate on the European roads since.

Where will it be produced?

The PAL-V LIBERTY will be assembled in the Netherlands. Specific parts and systems are manufactured by leading companies from a number of countries.

What about noise?

The noise is comparable to a small fixed-wing plane. It will be much more silent than a helicopter.

How long does it take to change modes?



To convert from drive to fly mode or vice versa will take 5-10 minutes.

What about Vertical Take-Off and Landing (VTOL)?

Vertical take-off requires a lot of energy which would significantly decrease the range of the PAL-V. Since the PAL-V is a flying car there is far less need for vertical take-off. You simply drive to a place where you can take-off. After landing you can reach your destination by driving there, true door-to-door mobility. Instead of platform-to-platform mobility.

What about electric flying?

In aviation weight is in direct relation with performance, influencing range, speed, payload, etc.... At this moment batteries are too heavy to be used for flying cars or human drones. With the current battery performance, there would be no practical range left to fly or you would not be able to carry any passengers or payload because of the efficiency and the weight of the batteries.

When does PAL-V expect to fly with electricity?

We have a solution already developed for electric propulsion. However, at the current development speed of batteries, we do not expect to see electric PAL-Vs within the upcoming 10 years. Apart from battery efficiency, the technology also needs to mature before it can pass the strict aviation certification.

What about a three or four-seater?

PAL-V has a road map for future products but at the moment the main focus is the PAL-V Liberty which for now can carry two passengers. This is sufficient to cover a very big portion of the market.

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