

AERODYNAMICS

(EN/PRODUKTE/ANTARES-
23ET/AERODYNAMIK/)

QUALITY & ERGONOMICS

(EN/PRODUKTE/ANTARES-
23ET/QUALITY-
ERGONOMICS/)

PROPULSION E

(EN/PRODUKTE/ANTARES-
23ET/ANTRIEB-E/)

PROPULSION T

(EN/PRODUKTE/ANTARES-
23ET/ANTRIEB-T/)

SAFETY

(EN/PRODUKTE/ANTARES-
23ET/SICHERHEIT/)

TECHNICAL DATA

(EN/PRODUKTE/ANTARES-
23ET/TECHN-DATEN/)

Propulsion E: Electrical spirit



Patented propulsion system

Our patented propulsion system has been especially developed for Antares sailplanes. It is the core of our LANGE-concept.

The brushless external rotor motor EM42 with 42 kW is the first electric motor to be officially approved by the European aeronautical authority EASA. With an effectiveness of 90% and a maximum torque of 216 Nm (159 ft lb) our propulsion E is not only unique in aviation. Together with light and environment friendly high performance batteries, innovative power electronics and a slow-moving propeller with a big diameter it is part of a custom tailored, integrated overall system.

With a maximum charging time of nine hours and a via SMS remote controlled load cycle, the Antares will be available to fly on any day.

The result of our approach is a so far unreached performance: a very good rate (ca. 4 m/s / 790 ft/min during initial climb), a sky-scraping climb altitude (more than 3,200m / 1050 ft in smooth air) and an almost noiseless flight.

High efficiency is one side of the Antares' innovative and patented propulsion concept. However to make an idea suitable for daily use you have to look for reliability, safety, economic feasibility and user confidence. In contrast to a combustion engine our propulsion method has a system related high operation reliability and runs almost vibration-free. Breakup- and fatigue limit problems are consequently avoided. What's more, we only need a relatively small amount of components and all of them are high-quality parts which minimizes the risk of default.

And, last but not least: Maintaining the propulsion E costs outstandingly little time and effort compared to a conventional aircraft engine.

Propeller

Developed and optimized especially for Antares sailplanes, the propeller blades are mounted directly on the electric engine's external rotor. The propeller's diameter measures a large 2 m (6.6 ft) resulting in a low revolution speed, high efficiency and little noise emission. Since the electric motor is independent of air density the only propulsion-component contingent on altitude is the propeller. At an altitude of 3,000 m (9.800 ft) its efficiency factor is only 4% less than at sea level.

For that reason the Antares 23E is best preconditioned to launch from high altitude airfields and great for mountain flying.

Propulsion control system

All the propulsion system's functions, like for example extending and retracting the propeller as well as power regulation are controlled by our patented "single lever control" on the left side of the cockpit. Controlling the propulsion unit works intuitively; it may very well be done without even looking at the handle. So the pilot may focus on flying and will not be distracted. The risk of operating errors is minimized.



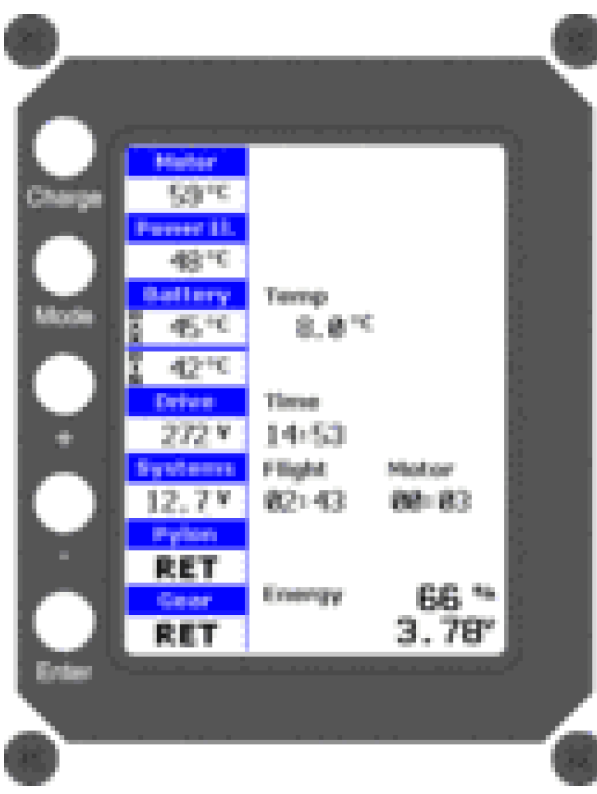
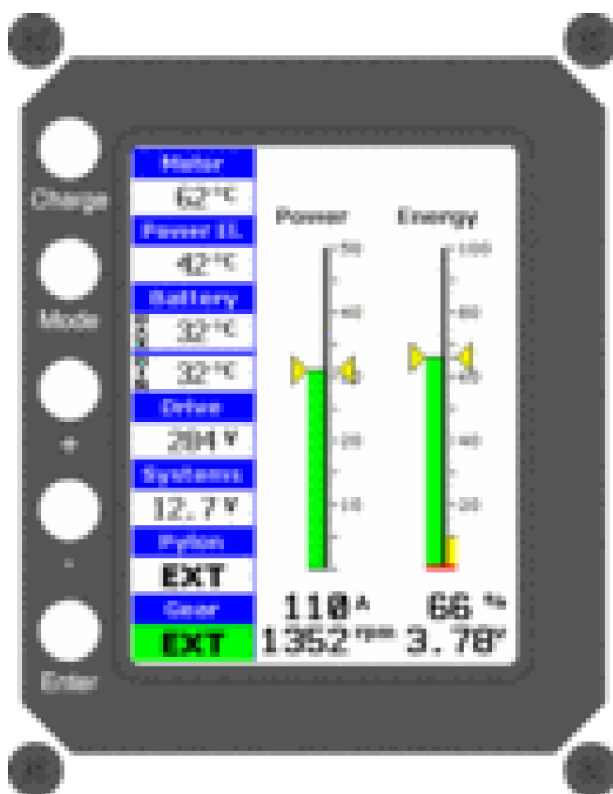
System monitoring

To observe systems like the electric drive, the battery-system or hydraulics the sailplane carries a central processing unit, numerous sensors and it has a big color display in the cockpit.

The main computer monitors the different subsystems and depicts all relevant system data plus some flight statistics on the instrument panel's big color screen.

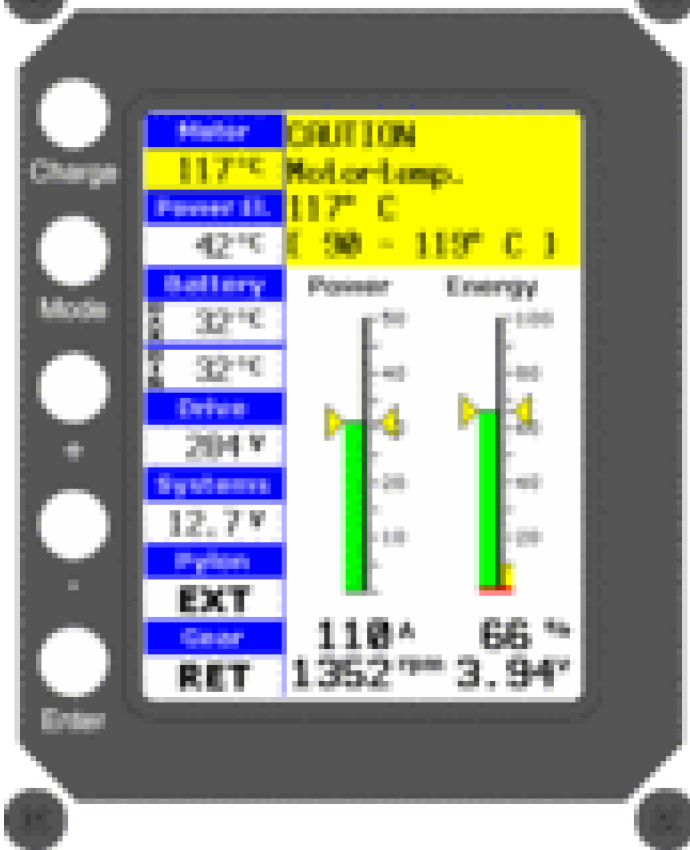
Should any parameter enter a critical range, its value will be displayed in a different color while an additional audio warning indicates the specific problem.

Before takeoff, the pilot uses the big display to go through the pre-flight checklist; at the end of a flight the main flight data may be pulled from an electronic logbook.

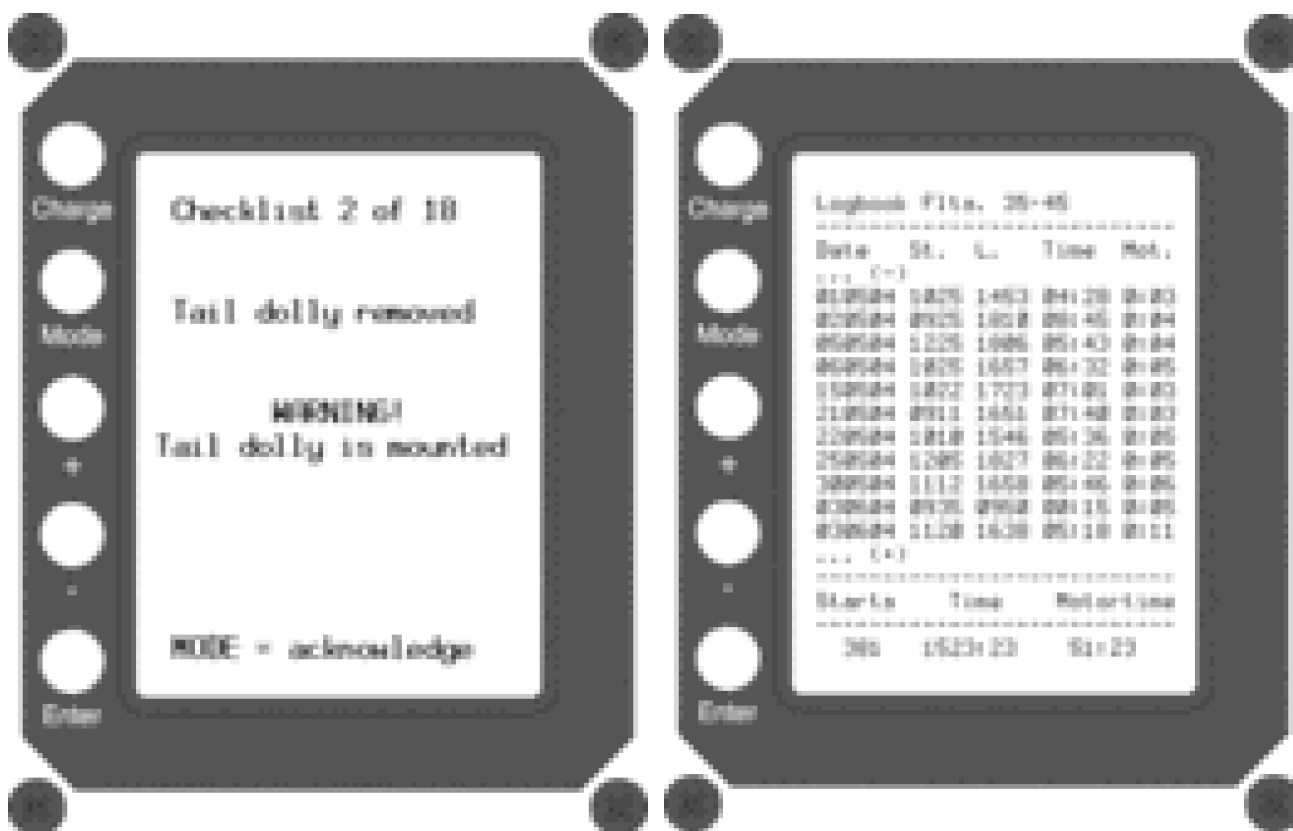


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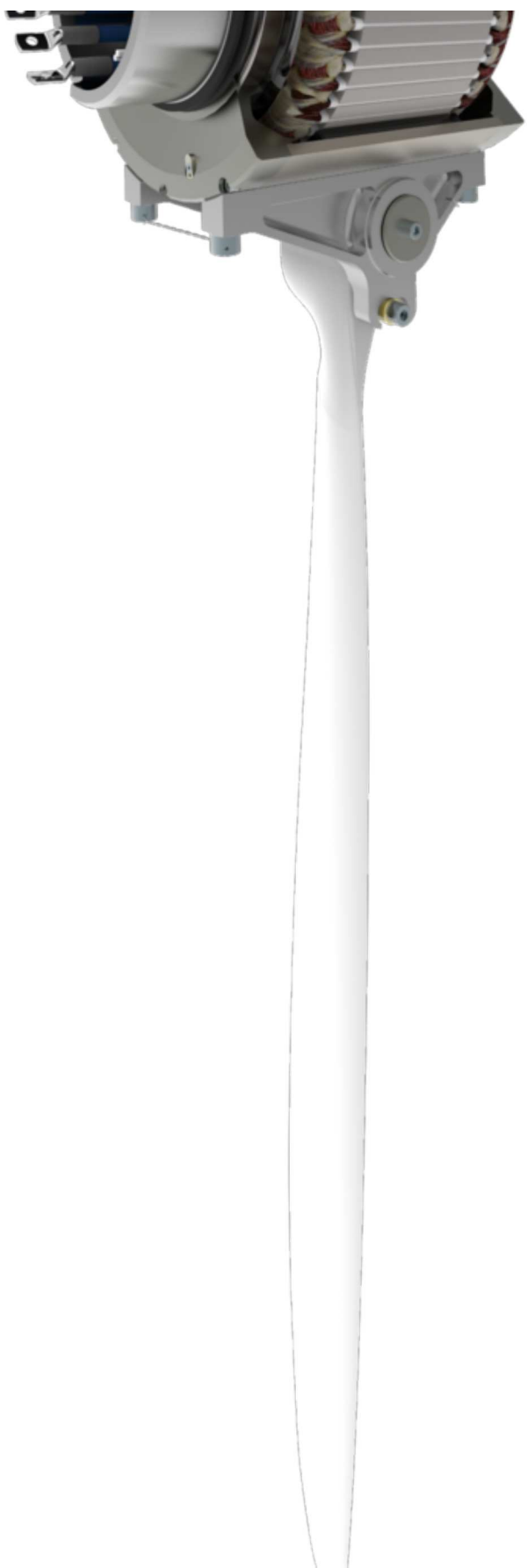
Experience has taught us that very little time is spent on monitoring the propulsion system. As long as no audio warnings are issued, the pilot assumes that the engine works perfectly and stays entirely focused on flying his aircraft.

Where possible and beneficial for safety, the main computer will use available sensors to automatically check (not override) pilot action. Some examples:

- An airbrake a warning will be issued when the pilot is working off his checklist or applying power with airbrakes extended.
- While working off the checklist a warning will be issued as long as the dolly is attached or when the landing gear switch is in "retracted" position.
- A landing gear warning will be issued once the pilot extends the airbrakes with the landing gear retracted.

Communication between the different aircraft subsystems is managed by two serial CAN-Bus systems. CAN-Bus systems were originally developed by Bosch for utilization in ABS-braking systems. The system is characterized by a data encoding which does not allow any erroneous data transfer. For this reason, CAN-Bus systems are meanwhile more and more common in the aviation industry.





Battery-system

The Antares 23E is equipped with a battery-system based on lithium-ion cells of type SAFT VL41M. Lange Aviation was the first company worldwide to use these batteries. Meanwhile a remarkable number of other users have recognized the advantages of this specific cell type, and its range of application is continuously growing.

Why lithium-ion cells?

Lithium is the lightest of all metals, and at the same time has the highest negative standard potential. Its low mass density and high voltage level result in a high specific energy density. Compared to other currently available lithium based cells (Li-Po / Li-Su), SAFT VL41M batteries have a great ability for high-current and a very high cyclic durability. Consequently SAFT VL41M Li-Ion cells represent the best electric energy source for an aircraft, while other merchantable battery types cannot be as capable.

Battery life

Two factors are crucial for the batteries' life expectancy:

- number of charge/discharge cycles
- natural aging

How many charge / discharge cycles?

The capacity of a battery diminishes with the number of charge and discharge cycles. According to most recent findings, our batteries will endure more than 4,500 SAE cycles. One SAE cycle stands for a full recharge, and a discharge down to 20% of the capacity. A partial charge and discharge equals the correspondent part of a full cycle. After 4,500 SAE cycles, the cells will still retain at least 80% of their original capacity. For the pilot, this means that the batteries will provide approximately 10,800,000 meters of altitude before they should be replaced.

Natural aging

Of course, in everyday life the natural chemical aging of a battery is even more relevant. When stored at an average temperature of 20°C (68°F), batteries should - according to the latest findings - be replaced after 20 years. At this point, too, they will still have a capacity of 80% compared to the original condition.

Availability

Being a user of SAFT VL41M cells, Lange Aviation is in good company. These Li-Ion cells are, among others, also utilized in most of the current European satellites. The military drone RQ-4B Global Hawk UAV, the F35 Joint Strike Fighter, the Airbus A350, and many other high-tech applications have adopted these batteries as well. Thanks to their military implementations the cells will at least be available until 2031.



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A total of 72 individual cells is distributed over 24 battery modules. Each module has 3 cells which share monitoring electronics and cell heating. Each cell's voltage and temperature is individually controlled. In addition, each cell is monitored redundantly for over- and under-voltage, and is equipped with an automated balancing circuit.



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