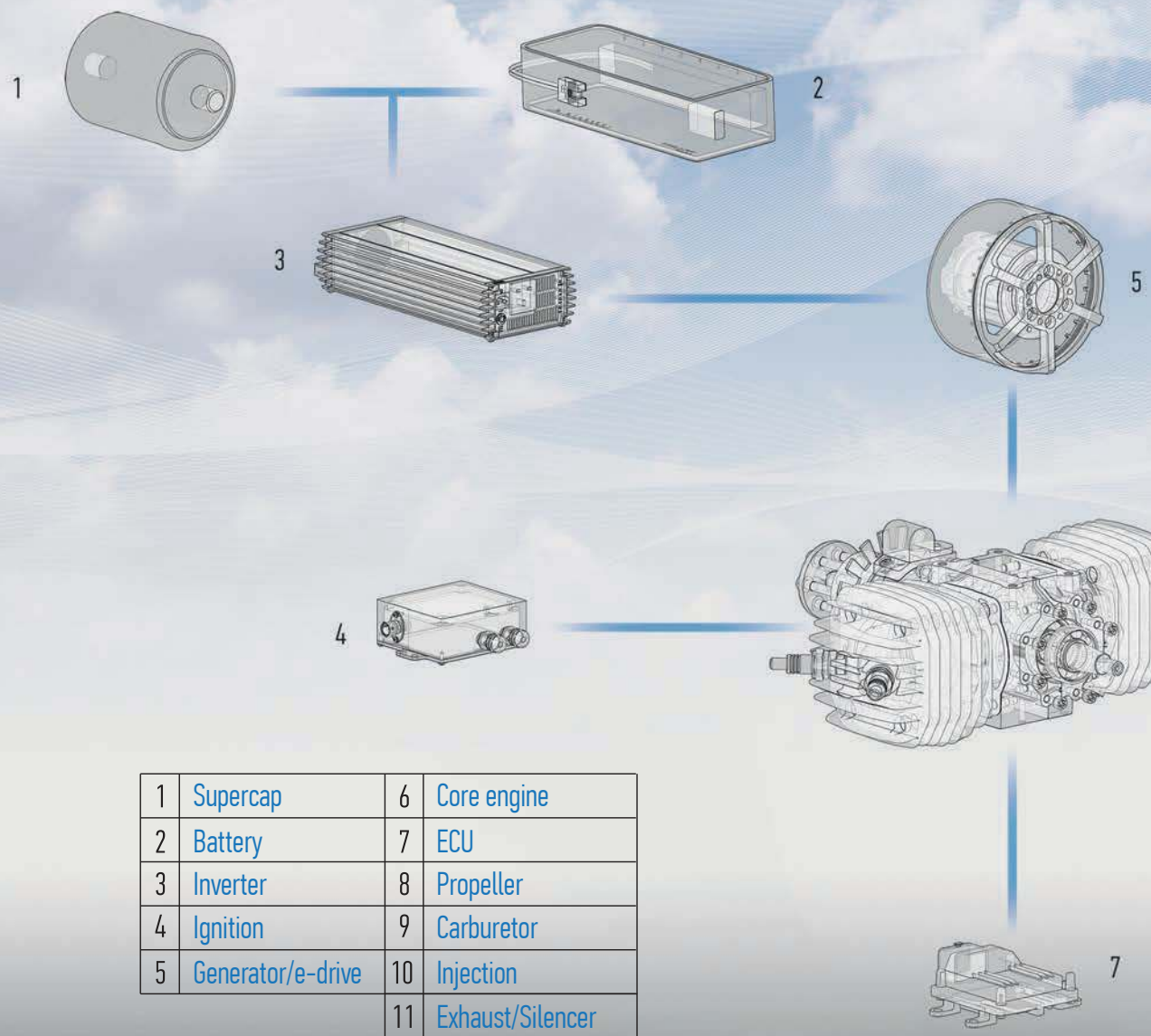

SKYPOWER

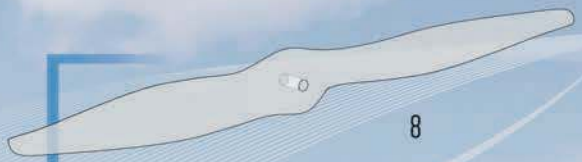
SKY POWER

**Sky Power GmbH** is the leading manufacturer of 2-stroke combustion and Wankel engines for UAS (Unmanned Aerial Systems) and hybrid applications. In addition to the development and manufacturing, **Sky Power** produces all engines in Germany. Custom adaptations, new developments and the capability expansion of the combustion engines are corporate objectives. All engines can be used in different configurations, according to customer needs. The engines are configured application-specific, as a direct propulsion unit, as a range extender in a hybrid configuration or as a power unit and generator.




| | | | |
|---|---|---|---|
| 1 | Supercap | 6 | Core engine |
| 2 | Battery | 7 | ECU |
| 3 | Inverter | 8 | Propeller |
| 4 | Ignition | 9 | Carburetor |
| 5 | Generator/e-drive | 10 | Injection |
| | | 11 | Exhaust/Silencer |

# SKY POWER Engine Kit



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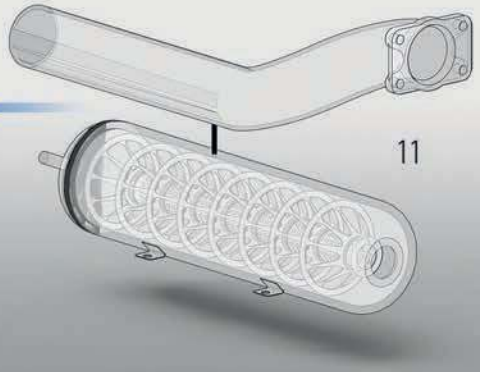

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**Sky Power** is introducing a novel UAS-engine configuration kit in order to enable even more efficient and performance-optimized engines in the future. Using this construction kit, propulsion units can be tuned to the customer's desired performance parameter and application areas.

The engine kit offers a large variety of components. At the center is the basic engine, which can be equipped with both a carburetor and the new injection from **Sky Power**. Exhaust, silencer, and the new ECU and ignition can be added as desired. Furthermore, the engine can be provided with an e-drive or generator, which uses a converter to generate electrical energy for batteries and super capacitors.

The engine can therefore be used as a power generator for electrical motors, but also as a combined system in which electrical and combustion energy can be used in combination. Single usage of combustion energy is likewise possible.

The performance parameters and application areas determine the engine's usage type and define the engine set-up.

# SKY POWER | SP-28

The SP-28 is the smallest single-cylinder engine in the Sky Power portfolio. The engine is equipped with a carburetor and an improved cylinder design for a higher thermal stability.
In the 2nd half of 2019 the engine will also be available with the new ignition SP-IGU.

## Specifications range SP-28:

| | |
|---|---|
| Type | 1-Cylinder Gas-Engine |
| Capacity | 28 ccm / 1.71 cu in |
| Power | approx. 3.4 HP / 2.5 KW |
| Speed range | 2500 - 10000 RPM |
| Weight | 2.5 lbs (1.1 kg) incl. carburetor |
| Crankshaft | 3 ball bearings |
| Oil/gasoline ratio | 1:50 / 2% mix |
| Operating voltage | 6 - 48 V DC |

Test method: Dynotest - Engine data might change due to the engine test procedure and the engine configuration.

# SKY POWER | SP-55

The single cylinder engine of the SP-55 series is designed with twin spark plugs and can be equipped with a carburetor or a fuel injection. The rear output shaft and the position of the carburetor or the fuel injection on the side, make this engine to one of the most compact 1-cylinder engines on the market. Because of the rear output shaft, a generator can be mounted on the back of the engine. All engines are equipped with the ignition HKZ215 and the ECU030.

## Versions:

- SP-55 TS ROS
- SP-55 FI TS ROS
- SP-55 HF FI TS ROS (available 2020)
- SP-55 FI TS ROS range extender for multicopter (available 2020)

> TS - Twin Spark, FI - Fuel Injection, HF - Heavy Fuel, ROS - Rear output shaft

## General series specifications range:

| | |
|---|---|
| Type | 1-Cylinder Gas-Engine |
| Capacity | 55 ccm / 3.35 cu in |
| Power | 4.18 HP / 3.1 KW |
| Speed range | 2000 - 10000 RPM (depending on version) |
| Weight | 4.55 lbs (2.06 kg) |
| Crankshaft | 4 ball bearings |
| Oil/gasoline ratio | 1:50 / 2% mix |
| Operating voltage | 6 - 48 V DC (depending on version) |

Test method: Dynotest - Engine data might change due to the engine test procedure and the engine configuration.

# SKY POWER | SP-110

The SP-110 is the smallest 2-cylinder engine in the Sky Power portfolio. The engine is designed with twin spark plugs and can be equipped with a carburetor or a fuel injection. The generator is mounted on the rear output shaft. All engines are equipped with the ignition HKZ215 and the ECU030. The electronics of the HKZ215 can be installed on an additional system carrier which sits on top of the cylinders. The engine is available with or without system carrier.

## Versions:

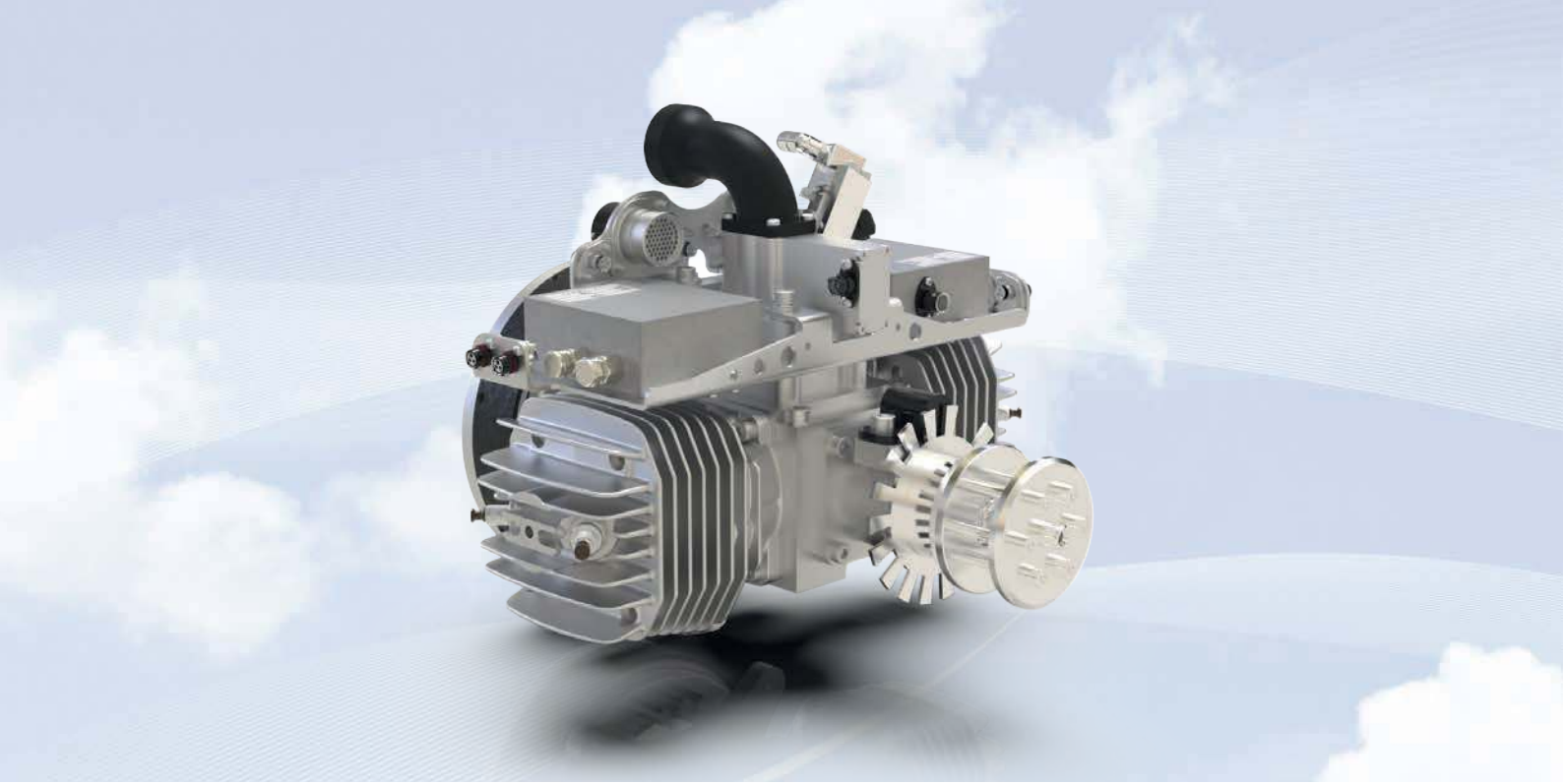
- SP-110 TS
- SP-110 FI TS
- SP-110 HF FI TS (available 2020)

> TS – Twin Spark, FI – Fuel Injection, HF – Heavy Fuel, ROS – Rear output shaft

## Specifications range SP-110 FI TS:

| | |
|---|---|
| Type | 2-Cylinder Gas-Engine |
| Capacity | 110 ccm / 6.7 cu in |
| Power | 7.48 HP / 5.5 KW @ 6000 RPM |
| Bore diameter | 1.77 inch (45.00 mm) |
| Stroke | 1.37 inch (35.00 mm) |
| Speed range | 2200 - 6500 RPM |
| Weight | 6.39 lbs (2.9 kg) |
| Crankshaft | 4 ball bearings |
| Oil/gasoline ratio | 1:50 / 2% mix |
| Operating voltage | 12V DC / 48V DC |
| Torque | 10 Nm @ 5000 RPM |

Test method: Dynotest - Engine data might change due to the engine test procedure and the engine configuration.



# SKY POWER | SP-170

The 2-cylinder engines of the SP-170 series are designed with twin spark plugs and can be equipped with a carburetor or a fuel injection. The generator is mounted on the rear output shaft. All engines are equipped with the ignition HKZ215 and the ECU030. The electronics of the HKZ215 can be installed on an additional system carrier which sits on top of the cylinders. The engine is available with or without system carrier.

## Versions:

- SP-170 TS
- SP-170 FI TS
- SP-170 HF FI TS (available 2020)

> TS - Twin Spark, FI - Fuel Injection, HF - Heavy Fuel, ROS - Rear output shaft

## General series specifications range:

| | |
|---|---|
| Type | 2-Cylinder Gas-Engine |
| Capacity | 170 ccm / 10.37 cu in |
| Power | 12.82 HP / 9.4 KW |
| Speed range | 1000 - 10000 RPM (depending on version) |
| Weight | 9,57 lbs (4.34 kg) |
| Crankshaft | 4 ball bearings |
| Oil/gasoline ratio | 1:50 / 2% mix |
| Operating voltage | 6 - 48 V DC (depending on version) |

Test method: Dynotest - Engine data might change due to the engine test procedure and the engine configuration.

# SKY POWER | SP-210

The SP-210 series is designed with twin spark plugs and can be equipped with a carburetor or a fuel injection. The generator is mounted on the rear output shaft. All engines are equipped with the ignition HKZ215 and the ECU030. The electronics of the HKZ215 can be installed on an additional system carrier which sits on top of the cylinders. The engine is available with or without system carrier.

## Versions:

- SP-210 TS
- SP-210 FI TS
- SP-210 HF FI TS (available 2020)

> TS – Twin Spark, FI – Fuel Injection, HF – Heavy Fuel, ROS – Rear output shaft

## Specifications range SP-210 FI TS:

| | |
|---|---|
| Type | 2-Cylinder Gas-Engine |
| Capacity | 210 ccm / 12.81 cu in |
| Power | 13.41 HP / 10.0 KW @ 6000 RPM |
| Bore diameter | 2.16 inch (55.00 mm) |
| Stroke | 1.77 inch (45.00 mm) |
| Speed range | 2200 - 6500 RPM |
| Weight | 12.74 lbs (5.78 kg) |
| Crankshaft | 4 ball bearing |
| Oil/gasoline ratio | 1:50 / 2 % mix |
| Operating voltage | 12V DC / 48V DC |
| Torque | 16 Nm @ 5500 RPM |

Test method: Dynotest - Engine data might change due to the engine test procedure and the engine configuration.

# SKY POWER | SP-275

The SP-275 series is designed with twin spark plugs and can be equipped with a carburetor or a fuel injection. The generator is mounted on the rear output shaft. All engines, except SP-275 TS CR, are equipped with the ignition HKZ215 and the ECU030. The electronics of the HKZ215 can be installed on an additional system carrier which sits on top of the cylinders. The engine is available with or without system carrier.
A dedicated version, the SP-275 TS CR, is designed especially for target drone applications. This version has a rear carburetor and has a low-profile design optimized for high speed training flights requiring minimal aerodynamic cross section.

## Versions:

- SP-275 TS CR
- SP-275 TS
- SP-275 FI TS
- SP-275 HF FI TS (available 2020)

> TS – Twin Spark, FI – Fuel Injection, HF – Heavy Fuel, ROS – Rear output shaft
> CR – Rear Carburetor

## General series specifications range:

| | |
|---|---|
| Type | 2-Cylinder Gas-Engine |
| Capacity | 275 ccm / 16.7 cu in |
| Power | 25.73 HP / 18.92 KW |
| Speed range | 2000 - 10000 RPM (depending on version) |
| Weight | 16.01 lbs (7,26 kg) |
| Crankshaft | 4 ball bearings |
| Crankshaft (SP-275 TS CR) | 3 ball bearings |
| Oil/gasoline ratio | 1:50 / 2% mix |
| Operating voltage | 6 - 48 V DC (depending on version) |

Test method: Dynotest - Engine data might change due to the engine test procedure and the engine configuration.

# SKY POWER | SP-180 SRE hybrid

The Sky Power Wankel Rotary UAS Engine is a hybrid electrical engine with a compact design and an outstanding power-to-weight ratio.
Therefore, the engine allows a higher payload capability. With the hybrid-boost power, additional 15KW, depending on on-board battery capacity, are optionally available. This additional power improves take-off performance significantly.
The SP-180 SRE hybrid can run with gas or Heavy Fuel (HF). Sky Power offers a standard fuel injection and an optional high-pressure fuel injection (HPI).
The cooling of the engine is guaranteed by water cooling of the housing and oil cooling of the rotor (active cooling), allowing reliable operation in certain challenging environmental conditions.

Test method: Dynotest - Engine data might change due to the engine test procedure and the engine configuration.

## Specifications SP-180 SRE hybrid:

| | |
|---|---|
| Type | Wankel Rotary UAS Engine |
| Capacity | 180cc |
| Power | 20 KW / 27.5 HP @ 6000 rpm |
| Torque | 32 Nm @ 6000 rpm / 36 Nm @ 7500 rpm |
| Weight | 6.80 kg / 14.99 lbs |
| Weight with generator | 9.50 kg / 20.94 lbs |
| Fuel | gasoline/heavy fuel |
| Fuel consumption | 340 g/kW @ max. load |
| Power | 20 KW / 27.5 HP @ 6000 rpm |
| Injection | standard manifold injection HPI (high pressure) injection optional |
| High power version | 28 KW / 38.5 HP @7500 rpm |
| Hybrid-boostpower | add. 15 KW |
| Power to weight ratio | 5.66 HP/kg / 2.57 HP/lbs |
| Cooling | water cooled housing & oil rotor cooling (active cooling) |
| Starter | starter-generator |

# ECU030

The **ECU030** controller can be used for both gasoline and heavy fuel applications. The system has four ignition channels and two separately parameterized injection nozzles. Pump pressure is regulated electronically. A dedicated cold-start procedure for each engine is easily integrated. The automatic controller adjusts the fuel mixture to the current cylinder temperature, air pressure and exterior temperature. All of the engine's data can be monitored electronically via the CAN-BUS-interface, and is also available as real-time in-flight telemetry. For initial engine set-up & integration Sky Power provides a custom PC software. The user interface is intuitively designed so that all of the engine's settings can be easily carried out."



# HKZ215

The high-performance **HKZ** system was developed for significantly greater ignition powers. The engine's overall fuel efficiency is thereby enhanced and the exhaust values improved. All of the add-on components, such as connector plugs and spark plug connectors, are designed and shielded for demanding applications.

# Accessories

## Sky Power Spark Plugs

This spark plugs can be used for all engines of the Sky Power portfolio.

## Blue foam air filter [S]

Ø 57 mm
30 mm high

## Blue foam air filter [M]

Ø 70 mm
54 mm high

## Blue foam air filter [L]

Ø 70 mm
74 mm high

# Project Development

Our customers are in different project stages of developing their products, when they are interested in an engine or a complete propulsion unit from **Sky Power**. In some cases our customers already know exactly what kind of propulsion performance is required for their UAS. In other cases, both sides have to work together to specify the next steps of development.

In order to be able to respond flexibly to these project conditions, **Sky Power** offers various project services to determine, together with the customer, the right engines and propulsion units.

## Project Consulting

If the project objective of our customers is not yet clearly outlined, we offer our consulting service. This may include the development as well as the system integration. The aim of the project consulting is to support the customer with technical knowledge and experience in the definition of his project objectives. How intensive and detailed this consulting is, depends decisively on the project and the level of knowledge of the customer.

## Project Workshops

Customers who are already in an ongoing project phase are often searching for a drive partner, who not only supports them with hardware, but also applies his knowledge and experience. In order to understand the added value **Sky Power** offers 1- or 2-day workshops. In these workshops the customers project and objectives are examined in more detail to define a possible cooperation framework. The goal of the workshop is the preparation of a tight project cooperation, in which the intentions and tasks of both partners are clearly defined. This may also include, that ultimately other propulsion solutions are determined, then were envisaged at the start of the cooperation.

## Project Management

**Sky Power** undertakes the entire project management for the development of a custom-fit propulsion solution. However, all technical parameters, schedules and budgets must be clarified and fixed in advance. Subsequently, the **Sky Power** team collaborates as closely as possible with the customer and is involved in all design and development steps of the UAS. The earlier this cooperation starts, the more system-related the propulsion solution can be specified and implemented.

# Service and Maintenance Work

## Engine break-in tests

**Sky Power** offers complete engine break-in tests. The customers engines are broken in on the in-house engine test stands according to specifications determined by the costumer. After the tests the "ready-to-fly" engine can be used immediately in the customers UAS. This saves preparation time and deployment can begin immediately. Instant sales can be generated with an engine broken in by **Sky Power**, especially in industrial and commercial applications.

## Customer and endurance tests (engine tests)

**Sky Power** conducts engine tests according to specifications determined by our customers. Individual usage parameters can be simulated in the process. Each engine test is documented. Of course, we make these results available. Thanks to highly exact measuring instruments, fuel consumption, engine parameters, and exhaust-gas temperatures can be measured. The engine tests can also include endurance tests, during which the engines are subjected to between 50 and 200 hours of continuous operation (with custom load-cycles) on the in-house engine test stands. Climate tests are also possible. After each test, the engines are disassembled and examined.

We can conduct the following tests:

- General performance measurement of combustion engines
- Thrust and power measurement
- Exhaust analysis
- Engine indexing
- Endurance testing
- Blower-, water-, and oil-pump analysis
- Cylinder head measurement
- Load-change calculation
- EMC measurements
- Climate and temperature tests

## Overhaul and maintenance

The time between overhauling (TBO) of **Sky Power** engines varies depending upon operating environment and maintenance schedule. After achieving maximum TBO, **Sky Power** can then overhaul the engine. The engine is typically sent to our manufacturing plant or an approved MRO location for an overhaul. For customers operating larger fleets we provide optional training enabling their staff to perform all maintenance, repair and overhaul tasks in-house.

The same applies for maintaining the engines. For each engine, there's an operating manual, which describes the individual maintenance steps and their intervals in detail. This operating manual is supplied with the engines. Moreover, we recommend that our customers order the associated spare-parts package for each engine to carry out simple maintenance tasks at any time.

For larger maintenance tasks, service can also be rendered at **Sky Power** in Germany. Customers can contact the **Sky Power** service department.

## Repair

Only the **Sky Power's** service department can generally repair an engine after a crash. Before sending the engine for repair, we ask customers to contact the department to clarify in advance whether or not a repair is even possible. Detailed engine tests are of course carried out as part of the repair work, to document the engine's operational readiness.

## Customer-specific service on request

The **Sky Power** customer service department will gladly develop an individual service concept based on our costumers needs.

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