The complete book for flying the Super-Dimona HK36TTC

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This document is an explanation of the operational use of the Super Dimona. It is not intended to replace the handbook. In the event of any conflicts with the text of the handbook, the latter is of course decisive. No rights can be derived from this document.

1. Checking the oil level

The Rotax engine has a 'dry sump'.
When the engine is running, the oil is not in the crankcase but is pumped from the crancase to a separate oil tank installed diagonally above the engine. And the dipstick to measure the oil level is in that separate oil tank.
When the engine is running, the oil pump sucks the oil from that oil tank, and it flows via the oil cooler and the oil filter to the parts to be lubricated and cooled.
The oil then leaks from the bearings to the engine crankcase and is then forced back up to the oil tank.
How: the combustion gases that leak past the pistons to the crankcase create an overpressure in the crankcase. Due to that pressure in the crankcase, the oil is pressed up from the crankcase to the oil tank.

If the engine stands still for a longer period of time, some of the oil from the oil tank will drop back to the crankcase via the oil pump. If you were to measure then, it would give you an incorrect indication, because you only see the amount of oil in the oil tank and you don't know how much oil has leaked into the crankcase. If you now would add oil, there would be more oil in the system than it can hold. If you have added oil in that situation and the engine starts, the oil is pressed from the crankcase into the already full oil tank. The tank overflows, causing the engine to become greasy and creating a fire hazard if the oil were to come into contact with the hot exhaust. So thats not how to do it.

How should you measure the oil level:
1. If you measure (with the dipstick) and the oil level is already (sufficiently) above “minimum” during the first check, then you know that there is sufficient oil in the system and you do not have to worry about it.
2. If the level at initial measuring is not sufficient:
The first method is to rotate the propeller by hand, the so-called 'torking'. Remove the oil cap, make sure the ignition key is out, activate the parking brake, position yourself so that if the engine starts you are as safe as possible. Turn the prop in the direction of rotation about 10 to 20 times until you hear the oil gurgling. And now measure again.
The second method is: start the engine and let it run for a while. Then measure.

According to the Rotax operator manual 2007 on pag. 10-15: “*Prior to oil check, turn the propellor by hand in direction of engine rotation several times to pump oil from the engine into the oil tank. Or let the engine idle for one minute*”.

Between min. and max. on the dipstick is 0.45 liters. If you have rotated the engine and you are 100% sure that all the oil is in the oil tank, and you measure that the oil is below the minimum, only then top up approximately 0.3 liters and measure again.
Oil: Aeroshell Sport plus 4 with “Rotax” print

The relationship between revolutions/minute and power of the engine:
The first part describes an engine without a turbocharger. Then the effect of a turbocharger is described.

Imagine mounting the engine in a workbench to do some experiments with it.
You will do those tests at **full throttle**. These tests demonstrate the relationship between the RPM and the power output of this petrol engine at full throttle.
● Remove the propeller from the engine and install a brake that allows you to load the engine (brake it, slow it down).
● Apply full throttle. And adjust the brake so that the RPM remains at your desired revolutions/minute.
● Then measure how hot the brake gets, i.e. how much power (Kilowatt or HP) the engine delivers tot he brake at full throttle and different RPM's.

Still at full throttle and heavy braking so that the engine runs at a low RPM, for example. 1,000 RPM (Revolutions/Minute). You measure how hot the brake gets, so how much power the engine delivers at full throttle and low RPM.
As an analogy: Drive your car at 50 km/h, engage 5th gear and apply full throttle. The engine may only run at 1,200 RPM. What do you notice: the engine produces very little power at full throttle and low speed and the car accelerates poorly. The car cannot drive up a slope at that low engine RPM. The engine is probably making an unhealthy noise now and will break down quickly.
Although at full throttle, the engine produces little power at this low RPM and protests violently; So there is a relationship between the RPM that you allow the engine to run at and the power the engine can deliver. At full throttle and low revs, the engine produces little power, so you are using the engine incorrectly. Maybe you are overloading the engine.
Back to the airplane engine: still running full throttle, release the brake a little and let the RPM increase to, for example, 2,500 RPM. The engine now delivers much higher power than it did at 1,000 RPM. Both at full throttle.
Analogy: You are still driving your car at 50 km/h and switch back to 2nd gear. The engine RPM is now much higher and the car accelerates better. So at a higher RPM (and still full throttle) the engine produces more power.

● The power that the engine delivers at full throttle depends on the RPM.
● The power increases if the RPM is allowed to increase.

"Higher power at higher speed" does not continue indefinitely;
If you accelerate your car too far in a low gear, the acceleration will eventually decrease at high RPM. There is no point in too high RPM's.
There is only one RPM at which an engine delivers maximum power at full throttle. For example: maximum power 90 KW at 5,500 revolutions/minute.
At all other RPM's and full throttle, the engine produces less power than at that one magic RPM. That is the RPM for max power.
So: If you want to accelerate quickly or drive up a hill, you would actually want to be able to run the engine continuously at that one specific RPM for maximum power, regardless of the speed of your car.
Unfortunately: With a car with a manual transmission you cannot run the engine at one continuous RPM while you accelerate.
Fortunately this is possible with the adjustable propeller of this Dimona.
With the Dimona you can set a desired engine RPM yourself, and that RPM will then remain constant, regardless of the flight speed.

Turbo-Compressor:
In a petrol engine without a turbo-compressor, the intake air is sucked into the cylinders. This creates a pressure in the inlet manifold that is lower than the ambient pressure. That pressure is called “manifold pressure”.

The Super Dimona's engine has a turbocharger, consisting of 2 parts:
Turbo: The exhaust gases pass through a turbine, forcing it to rotate rapidly
Compressor: The turbine drives a shaft that drives a compressor. That compresses the ambient air to a higher pressure so that the air is not sucked but blown into the cylinders. This compressed air causes the engine to deliver more power.
If you increse the throttle , more exhaust gases are produced, making the turbine to rotate faster and the compressor creates even more inlet pressure.
The turbo compressor has an Engine Control Unit to control the manifold pressure. The ECU controls a valve that determines how much exhaust gases flow through the turbine and how much exhaust gas do not flow through the turbine. That's called the “waste gate”.

When the engine is not running, the inlet pressure gauge (manifold pressure) indicates approximately 30 inches of “mercury pressure”. Converted, that is 76.2 cm of mercury pressure and that corresponds to 1,013 hPa (1 atmosphere). So when the engine is not running, the manifold pressure gauge indicates the current outside air pressure.
When the engine is running full throttle on the ground, the meter reads approximately 38 inches and from this you get an impression of how much extra pressure the turbo compressor gives to the intake air.

For example, if you fly at an altitude of 5,000 feet, the pressure of the outside air decreases by approximately 20% and that would result in a significant loss of power. However, the turbo compressor then increases that pressure back to approximately 35 inches, so still more than the atmospheric pressure at sea level. And the engine still continues to deliver plenty of power.

3. Power and RPM’s of the Rotax 914 F

- The Rotax 914F of this Super Dimona delivers the highest power of 84.5 KW (115 HP) at full throttle (38.4 inch manifold pressure) and at 2,385 RPM prop RPM
- That is 5,792 RPM engine RPM, but you can forget that number.
- It may deliver that highest power for a maximum of 5 minutes.
- At a slightly lower RPM of 2,260 prop-RPM and 34 inches, this engine produces 73.5 KW. The engine can deliver that power continuously.

The maximum cylinder head temperature and maximum oil temperature should also not be exceeded, so at higher outside temperatures it may be necessary to choose a lower continuous load.
Fuel consumption and wear are too high at higher powers. So don't fly with those high powers in cruise flight.