TITAN ZG 80PCI-HV

GB

Instructions

Toni Clark practical scale GmbH

5 years guarantee for TITAN model aircraft engines

More than 30 years experience with TITAN engines plus our quality control allows us to extend the period of guarantee from one to five years. This guarantee covers the engine and the ignition only.

The following conditions must be met to obtain the guarantee:

Guarantee is for the first owner only and is not transferable to any other person.

In the event of any claim, the engine must be returned to us with the original invoice. The serial number on the crankcase must be undamaged, and must not have been removed and reapplied. The serial number is registered by us with the buyers name and the date of purchase.

The only fuel to be used is the petrol oil mixture as specified in the instruction manual. Use of Methanol invalidates the guarantee.

The guarantee includes the Microprocessor Ignition unit, the maximum voltage of 9 volts must not be exceeded. Mechanical damage to the cables is not covered by guarantee.

The guarantee is that we replace any defective parts free of all labour and material costs and pay only the return postage and packing. This guarantee covers only the engine and can in no way be construed to cover anything else.

This guarantee does not cover crash and related damage in any form whatsoever.

Congratulations on your purchase of this fantastic Titan ZG 80PCI-HV.

You now possess an utterly reliable engine with real power in the form of high torque at relatively low RPM. The Titan ZG 80PCI-HV, fitted with the Microprocessor Ignition, will start just as easily as with the Easy Start System.

Please read this handling manual carefully. Do not be put off with the amount written, this is not the normal type of instruction manual but more a collection of mistakes that others have made and hopefully will assist you in avoiding such difficulties. I am sure you will agree, it is cheaper to learn from other peoples mistakes.

With the ZG 80PCI-HV there nothing that can be described as complicated or prone to give trouble. We thoroughly check each engine before it leaves our factory, each engine is stripped down and professionally reassembled. The certainty of only perfect engines leaving our factory is worth the 25 to 30 minutes it takes. Experience has clearly shown us, there are endless possibilities for user mistakes, due to a lack of know how, especially with the installation of the engine. The reliability of an engine stands and falls with how you install and handle it. It is up to you, read everything set down here thoroughly, follow these instruction exactly and you will get the very best out of your engine and be able to really enjoy our fascinating hobby. I have to tell you, there are modellers who ring us about self-made problems, the answers to their problems are nearly always to be found right here in these instructions. But of course from time to time a problem occurs, even when one has done everything by the book, and we are always available, well nearly, to answer any call for assistance.

The Titan ZG 80PCI-HV is a very powerful engine. Take every care and think carefully about the safety of others as well as yourself. For example check twice that the throttle lever is at tickover before attempting to start the engine. If you do not have anyone to help, you must anchor your model securely or flick the propeller over from behind the engine, using the other hand to hold the model, this way you are in no danger from the prop. A screwdriver stuck in the ground in front of each wheel is not only useless, it is dangerous!

Do not taxi your model back to the parking place. Switch off the engine and push the model, this may offend your ideas of professionalism but it is definitely safer. If suddenly while taxying with power on and something gives out with your radio, when the large prop has eaten its way through a friends model and not some part of his anatomy you can count yourself very lucky.

Engine installation

A firewall cut from 9 mm thick Birchply is sufficient, the fixing screws must be M6 Allen Screws with crown nuts behind the firewall. The screws must have spring washers fitted under the heads.

For cooling you do not need any especially large air inlets. But you must ensure that the air that has been forced into the cowl goes through the cooling fins and part flows over the carburettor. Remember that air flowing through the cowl takes the line of least resistance, this is to say it will not flow through the fins unless you take positive steps to make it do so. Use Balsa sheet to duct the cooling air through the fins, Balsa is ideal as this can rub against the motor without giving rise to metal to metal interference and is not affected by vibration. Remember that air, that passes the cooling fins at a grater distance than 2 mm, does nothing towards cooling the motor. Put another way: A motor sitting in a large cowl with a large intake area is badly cooled, unless you do something to force the air to go between the cooling fins.

Ignition installation in the model

The most important rule covering battery ignition systems first:

⚠ **Never ever switch the system on without the spark plug cap being on the spark plug!**

Keep all parts of the battery ignition as far as possible from the receiver, minimum distance being 15 cm.

The microprocessor Ignition is protected with a tough metal case and the electronics inside are encapsulated to protect against vibration. In spite of this it is not a good idea to simply mount the ignition box onto the firewall with a couple of cable ties.

Please fit the cables very carefully into your model, especially the high tension cable, as this will not contain the 21,000 volts if it is damaged due to scuffing against the cowl inner surface. If the screening flex is damaged due to scuffing when threaded through a GRP cowl opening, it will not be long before the inner insulation is damaged also. Then the HT will short out to the screening flex and this may cause massive radio interference and will of course lead to an ignition cutout.

⚠ **Mechanical damage caused to the HT cable is not covered by the guarantee!**

Switch

Use only knife edge contact switches such as our switch order no. #2024 or the Graupner receiver cable with charger socket order no. 3046. Toggle switches with roller contacts are not suitable as these are intended for 240 V. Used on low voltage, oxidation can occur, this increases the contact resistance and will lead to ignition failure.

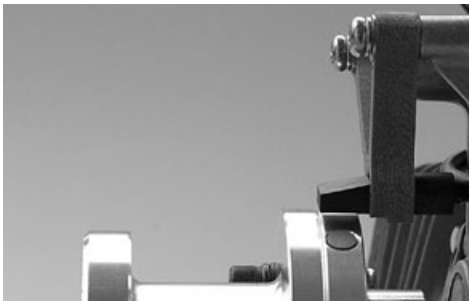
Take care with plugging together the JR-plugs and sockets by noting that the colours should line up on opposite sides. It is possible with a little extra effort to push these together with reverse polarity. No damage will be done but the ignition will of course be dead. I tape these plugs and sockets with insulation tape for additional safety.

We recommend to secure the connection additionally witch tape!

Fit the pickup head with the power coil screws as shown.

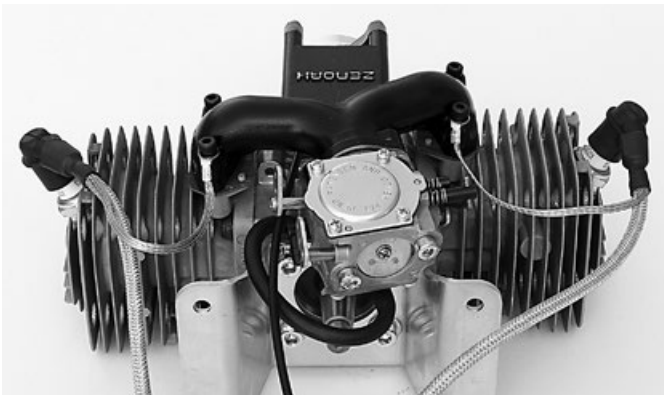
The ignition timing is automatically correct and cannot (and need not) be adjusted.

The gap between the pickup and magnet is not critical, it can be anything from 0,2 to 2 mm.



Looked at from the side, the pickup position is even less critical, you see here the middle position. Although 2 mm forwards or backwards will work perfectly well. The pickup is a tight fit in the pickup mount and secured with cyano. If the pickup is sitting outside the tolerance, washers can be used for packing between the pickup head and the crankcase.

Ground connection of the ignition with rubber spark plug cap



On the version with the original Zenoah rubber cap it is necessary to connect the ignition with the ground of the engine. The two ground straps have to be mounted on the intake manifold.

⚠ **Please make a range test prior the first flight.**

Without a good ground connection severe interferings will occur!

Spark plug

The very robust Champion RCJ-7Y resistor plug is fitted.
The contact gap is 25 thou or 0,6 - 0,7 mm.

Do your engine a favour by occasionally fitting a new spark plug:

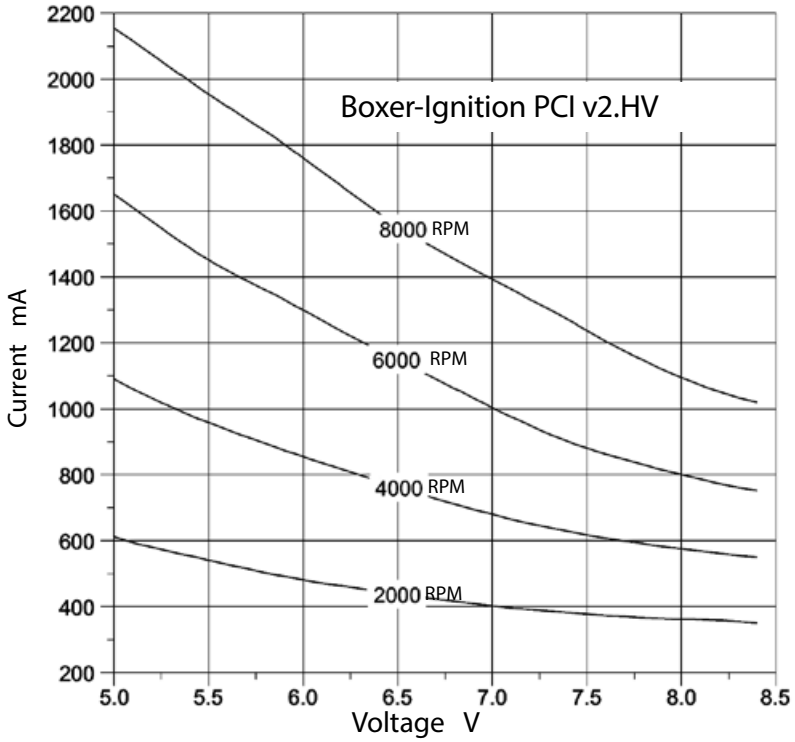
With increasing running time, a electrically conductive coating is build up out of the metal abrasion from the engine. As a result of this, a part of the spark energy gets lost before the spark fires. With the super fast Zenoah magneto ignition this effect does not matter, but it does for the battery ignition.

Battery

With the new PCI-HV ignition we have set the greatest value on a really strong spark. Of course, high- energy sparks are not possible without higher input power from the battery, but we believe this is a fair price to pay. With modern battery technology, the battery weight no longer matters, so why not go for the best possible starting, reliability and performance?

The PCI-HV ignition contains a very efficient voltage converter, which is capable of using the higher voltage instead of converting it to heat, as in the case of the common linear voltage regulators. With the PCI-HV ignition the rule is: the higher the voltage, the lower the current. Therefor it is best to use a 2s LiPo directly, without an external regulator, the flying time will be the longest.

Beside the 2s LiPo battery, there are quite a few other options. This can be a two cell A123 or LiFePO4 battery. Also a 5 or 6 cell Sanyo Enerloop 2000 NiMh can be used. Be warned, that if you go for a 4 cell NiCd or NiMH type, this has to be one with a low internal resistance. When the voltage drops below 4.8 V, the engine will start to misfire. A 2s LiPo is first choice for best capacity to weight ratio.



Current consumption in relation of battery-voltage and engine speed

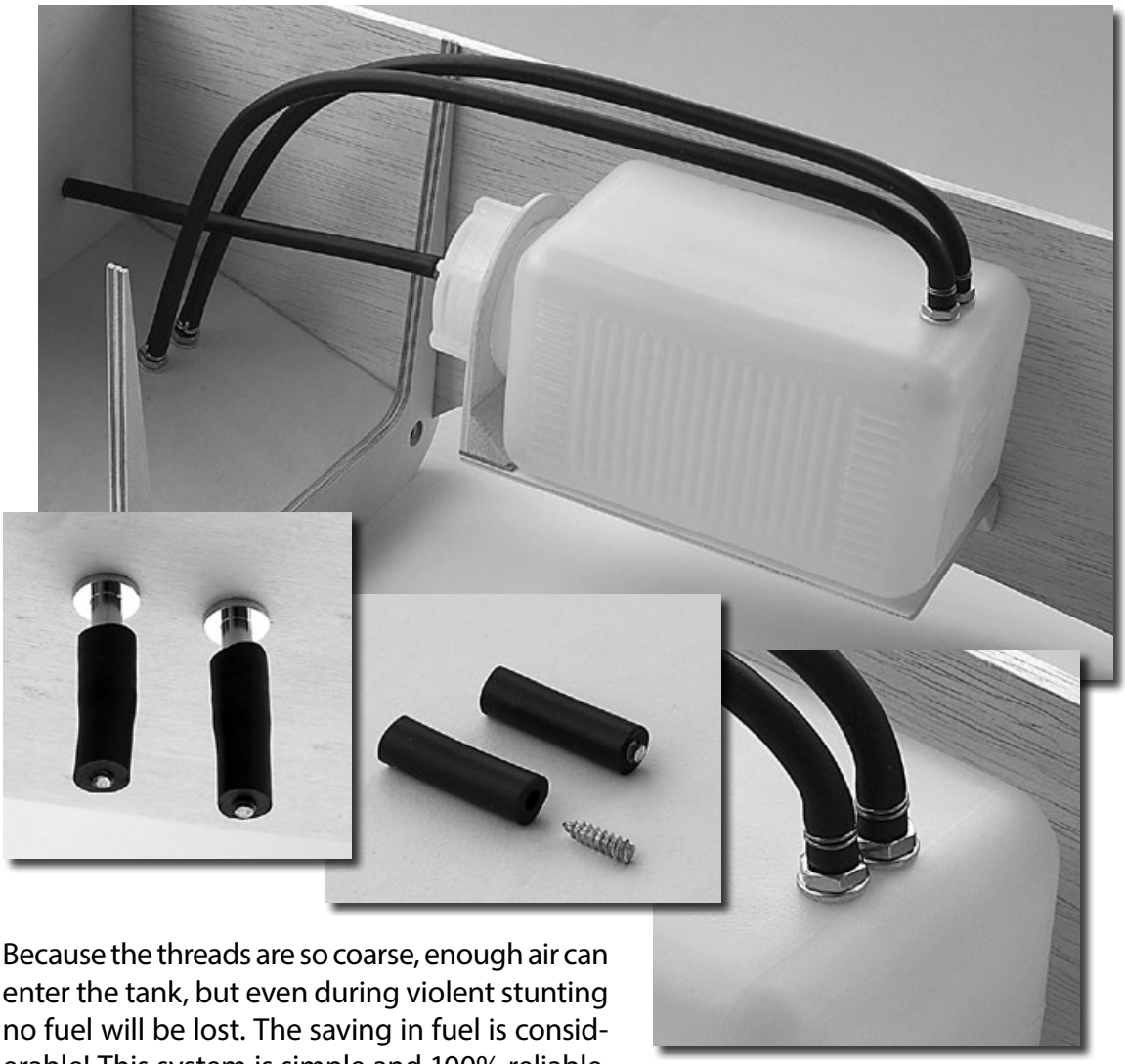
Current consumption Boxer-Ignition PCI v2.HV			
	2000 1/min	6000 1/min	8000 1/min
5,0 V	610 mA	1650 mA	2200 mA
5,5 V	550 mA	1420 mA	2000 mA
5,9 V	480 mA	1330 mA	1870 mA
6,6 V	430 mA	1100 mA	1560 mA
7,4 V	410 mA	990 mA	1320 mA
8,4 V	350 mA	750 mA	1050 mA

Under normal conditions, you will not fly at full throttle and certainly not at 8000 RPM all the time, therefor a 1000 mAh 2s LiPo battery is enough for two hours flying with safety. The idle current with engine stopped is approximately 30 mA. The PCI ignition does **no longer** automatically shut down when one minute has elapsed without the propeller being turned. This safety switching in the past has caused more frustration than doing any good.

Fuel tank

Make two air vents made with fuel tubing, fitted to two single sided nipples in the tanks topside, central at the rear end. These two air vent lines must be led forward over the tank and then down into the fuselage floor at the cooling air outlet of the engine cowling. One of these vent lines (does not matter which) is used to fill the tank.

These two lines are always shut off, with two 3,5 mm self tapping screws 15 mm long with heads removed, while the model is flying or otherwise parked.



Because the threads are so coarse, enough air can enter the tank, but even during violent stunting no fuel will be lost. The saving in fuel is considerable! This system is simple and 100% reliable, also during filling the tank, you will not spill fuel over your model. The double sided tank nipple from the clunk filter is best placed in the middle of the tank cap.

For the Titan ZG 80PCI-HV a 1000cc Tank is recommended. It is better for the tank to be built into the model at a level above that of the carburettor. The carburettor has non-return valves fitted, so that the fuel cannot run out through the carburettor as long as the engine is not running. For starting, it is better when the fuel line is full with fuel. With the engine running, it does not matter how long the fuel line is. You can install the tank anywhere you please in the model, at the CG position for example. But keep the fuel line as straight as you can. Avoid bends that will hold air bubbles.

It is impossible to prevent the fuel in the tank from foaming. This foaming means you must use our special cotton felt clunk filter - omit this clunk filter and your engine will draw more air than fuel. Model aircraft fuel filters are useless for petrol engines; the transparent automotive paper element fuel filters are also useless. The former have too coarse a mesh, and the latter have a large capacity, allowing air to accumulate and thereby causing the engine to stop, due to the sudden ingestion of this accumulated air by the carburettor. The second and very important reason for using our cotton felt filter is that in petrol there is always a certain amount of suspended matter, that is almost impossible to see with the naked eye. This dirt will easily pass through the model filter and build up in the carburettor, mainly in the low speed fuel passages. When this happens, the only cure is a new carburettor.

Fitting a T-piece in the fuel line between the tank and carburettor for tanking will be an obvious mistake to most folks, but we have seen this method of short-circuiting the felt clunk filter in the tank, with the obvious results, more often than one would imagine. ⚠

It is the best to leave a little fuel in the tank at all times

even when the model is in your home or workshop. This remaining fuel will prevent the carburettor diaphragms from drying out and becoming hard. Partially emptying the tank only when really necessary i.e. when tank is full. To drain excess fuel off, invert the model. As long as the self tapping screws are inserted, pressure cannot build up in the tank. Make these two vent lines airtight, then liquid fuel will be forced into the carburettor, causing a strong smell of petrol that cannot be ignored very easily.

Fuel tubing

Do not use transparent PVC-fuel tubing! This clear fuel tubing often fits neatly onto the nipples and seals nicely for a short while, but after a fairly short period, this clear tubing becomes hard and expands a little in the process, due to the action of the petrol. This tubing then moves due to engine vibration, allowing air to enter the fuel line. It is well nigh impossible to seal this PVC tube satisfactorily. ⚠

Our specially made, thick-wall Viton© fuel tubing is fairly soft and can be sealed perfectly at the nipples with 0.5 mm copper or brass wire, by being wound twice around the tubing and twisted together, or our hose clips #0099. Do not be tempted to use nylon tie straps or small Jubilee clips to seal the fuel lines, these straps and clips do not exert

pressure right around the tubing, they only serve to pull the tubing into an oval shape on a round nipple. The black fuel tube is very tough and due to having a very thick wall, it is not easily kinked.

A very good alternative tube is the transparent yellow **Tygon® F-4040** tubing. It is much lighter and does not expand in contact with petrol, also you can see air bubbles in the fuel. You must use more care in laying this Tygon tube in the model to ensure that there are no sharp bends. This tube is not especially heat resistant, therefore it follows it must not make contact with any hot engine parts.

Fuel

For fuel, use unleaded petrol with a minimum of 95 octane mixed with a full synthetic two stroke oil. The best two stroke oil you can buy is BEL RAY H1R. The advantage with this BEL RAY racing oil from the racing bike world is a up to 10-times better lubrication, more power, plus a top quality anti-corrosion element.

Attention with E10 Fuel: The shelf life is much shorter. Mixed fuel has to be used within 30 days.

Use a gasoline with as less ethanol as possible. The shelf life is much longer, the smell lower and the burning more gentle.

Breaking-in mixture

5 Liter gasoline and 125 ml oil = 40:1, this 5 Liter are enough for the breaking-in.

Mixture afterwards

5 Liter gasoline and 100 ml oil = 50:1, or per liter gasoline 20 ml oil.

TAKE GREAT CARE WHEN HANDLING PETROL:

USE ONLY THE SPECIAL AIRTIGHT RESERVE CANISTERS

NO SMOKING!

Propeller

We have set out here the RPM taken with a variety of propellers using a well run in ZG80PCI-HV. The silencers were the standard silencers supplied. The intake was fitted with the 60 mm long intake ram tube #7480. These figures can be rather more or less with your engine and are only provided as a fairly rough guide.

Menz-S 2-blade

Size	RPM
22x12"	6600
22x14"	6350
24x10"	6200
24x12"	5900
26x8"	6400
26x10"	5650

Super Silence-CF-2-blade

Size	RPM
23x12"	7100
24x12"	6850

Menz-S 3-blade

Size	RPM
20x12"	6600
20x14"	6300
21x12"	6250

Super Silence-CF-3-blade

Size	RPM
21x12"	7000
22x12"	6550
23x12"	5800

For best performance, especially with an aerobatic model, I prefer the 24x12" two blade Super Silence CF-prop, there is simply nothing better for this engine! For quietness, but with a little less power, I use the 22 x 12" three blade Super Silence CF-prop. I know, such super props are not exactly cheap, and many are looking for cheaper alternatives. They can choose from the Menz-S 24x10" 2-blade and the 21 x 12" three blade propellers, but will notice the lower performance.

Prop the engine to keep the RPM between 5800 and 7000, you may think this is rather low but the ZG80PCI-HV will run with plenty of power and there is no danger of overheating. Due to the lower RPM the sound is very pleasant and definitely not too loud. But in the air the revs will definitely increase somewhat.

You must balance each and every propeller. Some companies claim their propellers are balanced, do not take any chances, always check the propeller first before fitting.

WARNING: Should you decide to use a thermoplastic propeller such as Nylon, you must remember these can shed a blade, this can happen any time even if they are glass or carbon fibre filled. Due to the large diameter and the power of the ZG80PCI-HV these plastic propellers are loaded to the limit of their tensile strength. Also there are other weakening factors to be considered such as material fatigue, manufacturing faults and drying out.

Propeller fixing

Experience has shown that, without doubt, the safest method is to fix the propeller onto the ZG 80PCI-HV with a single large bolt and a wide flange on the prop hub. As long as the bolt is tightened down enough, the prop will not come loose. Should the propeller come loose by normal starting, then the prop bolt was not tightened down sufficiently, or the propeller has shrunk under pressure from the tightening down. But again, nothing dangerous will happen, you will not be able to overlook the loose bolt!

It is a real danger for persons and property to fix the propeller to the ZG 80PCI-HV with a multiple screw hub system. The problem is, that you will not notice if the screws are not tightened down sufficiently to provide enough friction between the propeller and the hub to prevent any movement at all between the two. The continuous firing stroke impulses from the engine can very quickly lead to metal fatigue in these fixing screws, should they not be tight enough. This fatigue will cause the screws to shear, allowing the propeller to fly off. This is not something I have dreamt up, I have seen it happen!

For the single prop bolt it is not possible to come loose while the engine is running, as every firing stroke impulse only serves to tighten the bolt more. But should the ZG 80PCI-HV be adapted for glow fuel and the timing be incorrect, it is then possible for the engine to start pinking (knocking) and, like the well known four stroke problem, this can lead to a prop being thrown.

Please do not fit a steel pin through the propeller and hub, the reason being the dowel holds the prop in place although the bolt may be loose. You may not notice this looseness, then suddenly the prop is split in two by the dowel. You can count yourself lucky with a near miss when this happens.

Should there not be enough resistance to movement between a smooth aluminium spinner back plate and the prop hub, the answer is to put a disc of 320 grit wet or dry paper between the hub and the back plate, the grit side against the back plate.

When you have understood what I am saying about propeller fixing bolts, and see that the friction between propeller and hub is the only means to give a safe fixing, you do not then have to envy your club friends, when they must bore a chain of holes around the hub of each new propeller, only to try to compensate for a too small and smooth prop hub surface.

Changing the propeller hub

We have 3 different lengths of propeller hubs. To remove and refit the two socket head screws, securing the propeller hub only requires a propeller to be firmly fixed to the hub to act as a lever.

Carburettor linkage

If you use a metal rod or a Bowden cable as carburettor linkage you have to avoid any metallic contact with the throttle lever. Always use plastic ball joints!

The carburettor is fitted with a spiral return spring on the butterfly valve shaft. This spring is light enough to leave in place, as modern servos can easily cope with such loads, this spring also serves to take up any amount of play in the throttle linkage. Removing the spring will result in irreparable damage to the carburettor! What happens is, with the spring removed, the butterfly valve is free to move and will hammer the walls of the venturi, thereby enlarging the venturi, the butterfly valve will not seal properly and this will prevent a stable tickover. The throttle lever on the carburettor can be taken off by removal of the small screw and the lever can be turned through 180 degrees if necessary. The screw must be secured again with Loctite®.

The key to a reliable and low idle: The Bowden cable between the servo and throttle lever has to be connected in such a way, that the return spring causes the throttle lever to press against the Bowden cable and not pull on it! Let me explain why this is so important: Engine vibration induces swinging of the bend in the Bowden cable, this wants to throw the cable outwards, similar to a skipping rope. If the return spring on the throttle lever pulls the cable inwards against this movement, it can cause the tickover speed to fluctuate considerably. On higher rpm there will be almost no swing and the spring is able to keep the cable inwards, but on lower rpm, often at about 2000 rpm, the cable may get into resonance and the swinging becomes stronger and will throw the cable outwards. This raises the rpm, as the cable now pulls on the throttle lever and opens the throttle. To compensate for this, you will be forced to throttle the engine down even more. At lets say 1800 rpm the cable will fall out of resonance and the spring will gain the upper hand again, closing the throttle completely and causing the engine to stop immediately.

WARNING! Never attempt to remove the screw holding the butterfly valve! This screw, you will notice, is spread on the threaded end to prevent screw loosening. If you remove the screw the threaded hole will be enlarged, you then have no alternative to purchasing a new carburettor. There is no way you are going to fix the screw safely into the damaged shaft; if the screw should ever become detached, it will be sucked straight into the engine, the engine will be completely ruined.

The choke valve can also be operated with a servo if required. Do not remove the spring and ball bearing selector for locking the choke spindle. A normal servo can overcome the resistance without a lot of effort. With mini servos set the servo throw on the transmitter to max value, i.e. 150% and use a small servo arm.

Sucking the intake air from inside the fuselage

The sucking of the intake air from the fuselage, with the intake RAM tube #7480 is a good way to reduce the noise of the engine. This also increases the performance and the throttle response, but the following points have to be taken into consideration:

To prime the engine, the choke butterfly valve must be completely shut and must not catch on the intake ram tube. This means that the intake ram tube must be exactly centred onto the carburettor. Shut the choke butterfly valve, mount the intake ram tube and tighten the two fixing screws. If you now cannot open the choke butterfly valve, you know that you have to readjust and try again.

Seal the cutout in the firewall against the intake RAM tube with a piece of 3cm thick foam. Prick a small hole into the foam and slide it tight over the intake RAM tube. The foam has to be tight, to prevent the engine from sucking it in. Crop the foam until it fits solidly into the cutout of the firewall.

Where the intake ram tube is not long enough to reach right through the firewall, it is best to fit a tube of a minimum of 50 mm diameter to go over the bell-mouth of the intake ram tube. This tube can be fairly long and can end in a silencer box. The gap between the 50 mm tube and the ram tube should be sealed with a piece of plastic sponge to make it almost airtight. The tube need not be round, it also can be a square box from 3 mm thick balsa sheet glued together. This tube does not effect the engine's performance, as it is in effect a reservoir of air and it's length will not detune the intake resonance.

Warmed air from the exhaust system must not be sucked in by the carburettor!

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The pressure in the cowl changes, depending on the attitude of flight and the velocity. The pressure is measured into the cowl and not where the Intake is. This affects the compensating diaphragm in the carburettor, causing the engine to run on wrong mixture. To avoid this you may increase the outlet area of the cowl or reduce the inlet area. A better answer is to solder a short piece of brass tube into the small hole on the steel cover plate above the compensating chamber and bring this tubing out to the same level as the intake tube bell mouth. The carburettor now reacts to the air pressure present at the intake and not the pressure inside the cowl. The engine should now run evenly in flight at every attitude.

If you use the intake ram tube and the engine sucks the air from inside the fuselage, something to be carefully avoided is loose objects such as small washers or nuts being sucked into the engine from the fuselage. You should make up an air filter, which can easily be done by cutting a square piece 10x10 centimetres from the filter mat that is supplied for kitchen air filters, and then gluing it to a Balsa frame. This filter element should be 20 mm away from the intake bell mouth. A (plastic) tea sieve placed over the intake bell mouth and glued directly onto the firewall works just as well and is easier to make.

Carburettor settings

The high and low speed needle valves have the letters **H=high speed, L=low speed** marked on the carburettor body adjacent to the respective needles.

Standard needle valve settings	H	L
Without intake ram tube	1 1/4	1
With intake ram tube	1	3/4

The **return stop screw** on the throttle lever is useful for the test stand, but when the throttle is operated by a servo this screw should be removed, so the motor can be shut off by pulling the trim lever back against the stop.

The adjustment of the high speed needle is very much influenced by the size of the propeller, as well as by the use of an intake ram tube. The standard needle valve setting is **low speed 1** and **high speed 1 1/4 turns** open. To find the correct setting for the high speed needle is quite easy. Tune the high speed needle on full throttle, until the engine speed peaks, than open it until the engine speed just not decreases. Turn the needles just a few degrees. The maximum deviations from the standard settings are ± $^1/_4$ turns.

For a reliable tickover you must adjust the slow speed needle in steps of 10 degrees and wait for the reaction for about 20 seconds before further adjustment. You can improve the acceleration by fitting an intake ram tube, a ram tube also will considerably reduce the fuel consumption. It is better to fit a slow reacting servo on the throttle. And when you are running the ZG 80PCI-HV on the test stand, do not let the spring slam the throttle to the closed position, just move the throttle lever at the same speed as the servo would.

We have discovered that it is an advantage to paint the inside surface of the intake manifold with two component car paint. This leads to less fuel droplets forming or more probable, these droplets do not adhere so strongly.

You can only tell from the engine performance in flight whether the carburettor is correctly adjusted, additionally you should check the colour of the spark plug. To check the spark plug colour it is essential that the engine be shut off at full throttle after running for few minutes on full throttle. It is no use to check for colour after the engine has been running at tickover. The ideal colour is an even soft brown. When the plug is black and oily it is of course too rich, when whitish or with an appearance of being glazed over then the mixture is too weak.

Starting the engine

Due to the Microprocessor battery ignition starting the engine is very easy. Although the starting method is entirely different to what you are possibly used to with the magneto ignition.

One important point to begin:

Never prime the engine by sucking in with a switched off ignition! The battery ignition, unlike the magneto ignition, will not start the engine with a wet plug.

For starting follow these rules exactly:

1. Fill the tank (very helpful).
2. Close the choke.
3. Set the throttle at a slightly higher setting than normal tickover.
4. Have someone hold the model.
5. **Switch on the ignition.**
6. Immediately hit the prop **without any prior sucking in.**
7. The engine will start as soon as enough fuel air mix is ingested due to the closed choke, and will turn a couple of times and stop as the choke is not opened. This is nothing for concern, the engine has shown you there is enough fuel ingested. It remains to open the choke and with a couple of flicks the engine will fire, burn off the excess fuel and run.
8. Let the engine warm up for about 15 seconds before advancing the throttle.

It is to no purpose to violently flick the propeller, just lightly flick the prop over the TDC, you will notice it only takes the small finger at the propeller tip to do this. An elegant method is to flick the propeller over from behind the engine, using the other hand to hold the model, this way you are in no danger from the prop. You will find it pays to have the transmitter in range from your flicking hand.

Attention

This PCI-HV ignition will NOT automatically shut down when one minute has elapsed without the propeller being turned. This safety switching was a slight problem if you get distracted when starting and you do not turn the propeller at least once inside one minute and forget to switch off and on to reactivate the ignition. With the ignition shut down you will easily suck the engine full of fuel before you notice what is wrong and it will then be probably too late and you will have to remove the spark plug and shake out the petrol.

Nevertheless always switch off the battery ignition immediately after finishing a flight as

during the minute it only requires someone to carelessly flick the propeller once. Further with the engine stopped, the ignition still draws a small current of 30 mA that will unnecessarily flatten the battery when forgotten.

The ignition has to switched off after every flight!

Running in the engine

This is the critical time in a engine's life. Do not use the glow-engines method of a really rich set needle valve on a test stand on half power, rather set the needles on the Titan ZG 80PCI-HV to a normal position and **fly** the new engine with very short periods of full throttle and long periods of tickover. You will of course ensure that the mixture setting is not on the lean side. Avoid letting the engine run at half or three quarter throttle for long periods. After the first tank full you can increase gradually the full throttle periods. After four tank fulls you can fly full throttle for as long as you wish.

Experience has shown the power steadily increases over the first fifty flights and even after this time, the power will increase from season to season, due to the build-up of carbon deposits on the piston crown and on the combustion chamber walls. This carbon build-up increases the compression ratio. Because the engine is designed for an extraordinary long life span, even when mineral based two stroke oils are used, the designers had chosen a relatively low compression ratio to allow for a considerable amount of carbon build-up. So "don't worry" about carbon build-up and as long as it is not in the piston ring groove, do not remove it, instead "be happy" about the extra power!

It is far better to break in the engine in a model with the engine cowling fitted. Due to the unequal temperature distribution around the cylinders, because of the unequal cooling airflow, the cylinders always tends to slightly distort. A new piston ring, with his special surface treatment, can easily adjust to this condition. During the first hour of running in, the piston rings will continually get polished and thereby it's surface becomes harder. An engine, that has been run in on the test stand, must run for a considerable longer length of time, until it has settled down to the new and almost always completely different temperature distribution under the models engine cowling.

Very important:

Although the microprocessor ignition unit is perfectly screened, please make a range test with full throttle before the first flight. Use a small propeller to simulate the rpm when the model is in the air. The range difference with the engine shut off and running at full throttle should be minimal.

I can advise you strongly, to fly only with a double battery pack. Experience has taught me that this is something never to fly without. The double battery pack I use is with two separate plugs, two separate switches and the batteries separated with diodes. You can use a servo socket for the second switch harness.

Install the receiver, battery and servos as far away as possible from the engine and particularly from the microprocessor ignition unit; in certain cases the interference

comes not through the aerial, but through the wiring from the batteries or the servos. A double superhet will not help!!! Most cases of interference are not caused by the ignition, but through metal to metal generated noise or from a servo pot wiper that has suddenly become faulty.

Maintenance

The Titan ZG 80PCI-HV requires almost no servicing. If your engine is difficult to start after the hibernation, suck fresh petrol into the carb to loosen the thick oil left after the petrol has evaporated, and let this stand for a few days and you will find the engine will run again without any adjustment of the needle valves.

Never use compressed air to clean the carburettor. Never remove the fine stainless steel gauze filter in the carburettor for any reason. When you have followed our advice and fitted a cotton felt clunk filter, there will never be any dirt in the carburettor, but there may well be fine cotton fibres over the small gauze filter (this is the sole reason for this filter). You can remove these fibres carefully with a toothpick, or tweezers.

If you wish to check the screws on the engine for tightness, please use the following table showing torque settings. Especially critical are the four cylinder retaining screws. These must never be really „pulled down“, otherwise the cylinder gasket, which is fairly thick, will squash at the corners of the cylinder flange, causing the flange corners to bend down and resulting in distortion of the cylinder. Cylinders so over tightened will be difficult to turn through BDC when hot and will not be able to run at a low tickover and will have considerably less power. This easily can happen with owners who having just purchased a brand new engine and having nothing better to do than to really pull down all the screws, the cylinder will then be useless scrap metal. If you do not have a feel for tightening down screws or do not posses a torque wrench, then it is better and cheaper, you leave them well alone.

	Thread	Tightening torque
Cylinder bolt	M5	7 Nm (5 lbsft)
Crankcase bolt	M5	7 Nm (5 lbsft)
Propeller hub bolt	M6	10 Nm (7 lbsft)
Rotor nut	M10x1	30 Nm (22 lbsft)

Thank you for taking the trouble to read carefully what I have written here. Have fun with your ZG 80PCI-HV!

Gerhard Reinsch, Rene Neumann and Toni Clark.

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