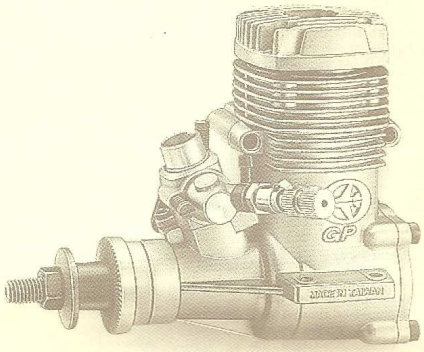
ENGINE OPERATING INSTRUCTIONS



★ GP-42/9041 SHOWN

INTRODUCTION

Congratulations on your purchase of a Thunder Tiger model engine. The latest Thunder Tiger GP series engines have been designed to combine the high performance with easy handling and maintenance using modern CAD computer technology. Major components of the engines are machined from the highest quality materials using state-of-the art CNC manufacturing techniques,resulting in consistently high quality and reliability. Your Thunder Tiger GP engine is equipped with easy maintenance sleeve bearing, Schunuerle porting, special ABN piston and cylinder sleeve, easier adjusted air-bleed carburetor, safe angular needle valve and has been produced to meet the requirements of both beginners and sport flyers.

LEARNING ABOUT YOUR ENGINE

Before actually operate your engine, the following information are for the benefit of the newcomers with no previous experience of model engines. Please put the engines near your hand and read this instruction. The model engine is just like the engine of a motorcycle or a car that need a key to start. You have to prepare some accessories and knowledge. It is not hard to operate your model engine by following the instructuions properly.

SPECIAL ATTENTION

When you crank the crankshaft of your engine by hand, you may find that it becomes rough or "notchy" as the piston approaches TDC (Top Dead Center). This is not a defect or manufacturing fault, indeed it is normal for an engine of ABC type construction. When the engine runs, the top of the sleeve actually expands as it heats. The cylinder sleeve has been precision machined so that (at optimum operating temperture) the cylinder walls are perfectly aligned with the piston. As the engine cools after a run, you will notice that the tightness will actually return. This is normal and typical of an ABC type engine.

NECESSARY OF THE ACCESSORY

The following items are necessary for operating the engine, these are available at you hobby dealer.

FUEL

A good quality, commercially available fuel containing 25% lubricant and 75% methanol is recommended for break-in /run-in and general usage. We also recommend castor oil or a castor /synthetic blend only for use as a lubricant. Fuel containing 5%~15% nitromathane and 20% lubricant is for use when more power is required. Most fuels containing synthetic lubricants (only) are much less tolerance of a lean run compared to fuel that contains castor oil. If availability or local conditions force you to use a fuel that contains only synthetic lubricant, we suggest that you keep your needle valve set to a slightly richer setting, allowing more lubricant to flow through your engine to extend engine life and maintain optimum reliability. Do not use fuel containing less than 20% lubricant.

CAUTION 1

Methanol and nitromethane are poisonous and highly flammable. Keep out of reach from small children and keep away from heat and open flame.

CAUTION 2

Excessive heat can greatly reduce the life of your engine. Most of the heat generated by combustion is removed via the lubricants that are contained in your fuel, and exits the engine as exhaust vapor. As a precaution, you should periodically remove the muffler from your engine and visually inspect the exhaust port and piston. If the outer surface of the piston is stained a very dark color, it can indicate that your engine may be overheating. This can be caused by either an excessively lean needle setting or a lack of airflow across the cylinder and head.

CAUTION 3

Enclosed cowlings look great but can harm your engine if not constructed for proper airflow! A general "rule of thumb" is to allow twice the area of air exiting the cowl as entering it (i.e. if your cowl has 4 sq.in. of inlet area, it should have 8 sq.in. of exit area). The above guidelines are particularly critical when using fuels containing only synthetic lubricant.

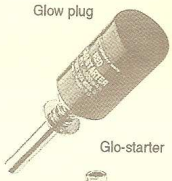
GLOW PLUG

The type and quality of glow plug used will have a maior impact on overall performance and reliability under different atomospheric conditions and on different fuels. As a starting point, Thunder Tiger No.9281 R/C long type, K&B, O.S.No.8, ENYA No.3 are recommended. Select the best one by pracical tests.

Glow plug

GLO-STARTER

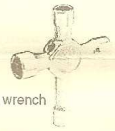
The electric power source for heating the glow plug.



Glo-starter

PLUG WRENCH

Used for installing or removing glow plug and also fits the propeller nut. 4-way type (Thunder Tiger No.1102 4-way wrench) is preferred.



Plug wrench

FUEL PUMP OR BOTTLE

Required to fuel the fuel tank in your model. A Thunder Tiger No.1645 hand crank fuel pump or an electric pump No.1656 and No.1658 are available at your hobby dealer.

ELECTRIC STARTER WITH STARTER BATTERY

A Thunder Tiger electric starter may be used to start the engine, too. It is used together with the 12-volt battery. Most engine can be started more quickly with an electric starter. But even beginners will find new Thunder Tiger GP series engines are easy to start by using a chicken stick.

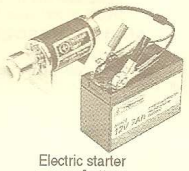
Fuel pump

CHICKEN STICK/SAFETY STICK

Used to flip the propeller for starting the engine without electric starter.

FUEL TANK

Choose the proper one to fit your model. A series of all new Thunder Tiger fuel tank are available at your hobby dealer.



Electric starter w/battery

FUEL LINE

The fuel flows thruogh fuel line to the carburetor.

PROPELLER

Suggested propeller sizes are shown in the table below, with allowances for different types of aircraft and performance goals. Keep in mind that factors such as aircraft size, weight, style and type of flying will all affect your choice of propellers. After break-in, select the optimum propeller size by practical flying tests to determine what propeller size is best suited for your airplane/engine combination. Begin your tests with the suggested propeller sizes contained in the table below.

	BREAK-IN	PATTERN/AEROBATIC	SPORT/SCALE
GP-42	10X6	10X6	10X6, 10.5X7

Don't use propellers with defective blades or crooked material. A blade throw from a propeller can be a lethal projectile.

INSTALLATION

ENGINE

Mount your engine securely to rigid hardwood rails (e.g.maple) or a radial mount of metal or glass-filled nylon composition.The top surfaces of the motor mount must be absolutely flat and parallel to avoid stress and crankcase distortion. Be sure to use only the highest quality mounting hardware(such as hardened steel screws, steel hex nuts, steel lock washers, etc.). In order to reduce engine noise, flexible motor mounts can also be used, although you should expect a very slight decrease in performance of 100~200 R.P.M. at full throttle.

MUFFLER/SILENCER

After the engine is mounted onto your model, secure the muffler/silencer to the engine with two screws equiped with your engine. Be sure to tighten them firmly. The rear half of the muffler can be rotated to direct the exhaust residue away.

FUEL TANK

The fuel tank should be located as close to the engine as possible. Ideally, the centerline of the tank should be level with the carburetor spray nozzle. The design of your particular aircraft will determine actual tank location, but use the above instruction as a guide. Keep in mind that tank location can have a large impact on engine performance. Make sure that your entire fuel tank system is

sealed and well constructed to eliminate the possibility of fuel or air leakage. If possible, wrap your fuel tank with high quality foam rubber to reduce fuel foaming due to airframe vibration.

FUEL AND PRESSURE LINES

After installing the engine, use knife or razor blade to cut the silicone tube to proper length for use as fuel and pressure lines. Conneect the fuel tank to the carburetor and the fuel tank to the pressure fitting on your muffler. Do not use any tool to cut the silicone tube that may cause it to split or crack.

GLOW PLUG

Use 4-way wrench to screw the glow plug into your engine and do not over tighten. Be sure to put the glow plug washer between the cylinder head and glow plug to eliminate gas leakage.

PROPELLER

Fix the propeller and spinner back-plate(If you plan to use a spinner) firmly to the engine. Screw the propeller slowly to the crankshaft of your engine in a counter-clockwise direction until compression is first felt near the position that the piston close to TDC. Turn the propeller with blades horizontal approx 0° ~10° and use a 4-way wrench to tighten the propeller nut.

CAUTION 1
It is extremely important to check the balance of your propeller before attaching it onto your engine. An unbalanced propeller can cause substantial damage to both the aircraft and engine!

CAUTION 2
If you plan to use a spinner, make sure that the cut-out for the blades is sufficient so the spinner does not contact the propeller blades. This will prevent the spinner from cutting into the propeller blade and weakening it.

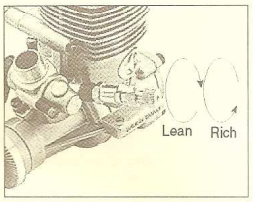
PREPARATION FOR STARTING YOUR ENGINE

FILLING TO FUEL TANK

Disconnect the pressure line from pressure fitting on the muffler and fuel line from the fuel inlet on the carburetor. Connect the fuel line to the tubing from fuel pump to fill the fuel tank until fuel overflow into the pressure line after the tank is filled. Re-connect fuel line to fuel inlet and pressure line to pressure fitting. Be sure to not let dirt or dust enter fuel container.

PRE-ADJUST NEEDLE VALVE

Turn the needle valve clockwise until you begin to feel resistance. This is the fully closed position. Do not force the needle valve or you may damage your carburetor! It may be convenient to remember the position of the socket set screw on the end of the needle valve. Now turn the needle valve counter-clockwise about 2~2-1/2 turns. This will be a good place to start. (Turn the needle valve clockwise is to "close" for leaner mixture, while counter-clockwise is to "open" for richer mixture.)

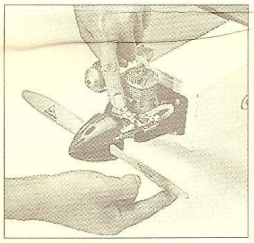


CHOKING/PRIMING YOUR EGNINE

Turn on your control system and shift the throttle stick to test. Use the transmitter to open the throttle to 1/2~3/4.

Place your finger over the carburetor opening (and be sure without glow plug battery connected!) and rotate the propeller 2~3 turns or until fuel flows into the carburetor.The quantity of fuel drawn into the engine by priming is an important factor for starting your engine successfully. It needs more choke for the first starting and when the engine is cold. It will be quickly learned with experience.

After choking, let your finger leave the carburetor and turn the propeller 3~4 turns counter-clockwise smartly by finger. If you use an electric starter, skip this step.



HEATIGN GLOW PLUG

Fit the glo-starter or connect the 1.5 volt ignition battery onto the glow plug. The platinum alloy coil inside the glow plug is heated up with the starter battery current, and remains hot to keep the engine running even after the electric power is cut off.

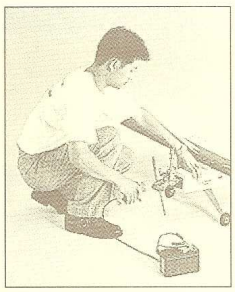
STARTING

FLIPPING PROPELLLER TO START

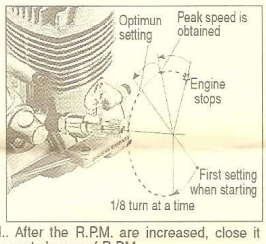
Reduce the throttle opening to 1/4~1/2 open, and flip the propeller to start the engine by using a "chick-stick" or an electric starter. The engine should fire after a few seconds. When starting the engine, have a helper at the left rear side of the engine where no smoke is coming to hold your aircracft so that it can be sure not to move forward.

CAUTION 1
Do not place any thing over the path of the propeller.

CAUTION 2
It is better to put stick at 1/3 from blade bottom of the propeller, and use a chicken stick to turn the propeller. You may need to practice how to flip the propeller quickly before filling the fuel tank or without connecting the battery. Quick flipping and adequate priming are important factor for starting your engine successfully.



NEEDLE VALVE ADJUSTMENT



After the engine starts, advance the throttle to full open. At this point, the engine should be running very "rich" (i.e. dense smoke coming from the exhaust). Close the needle valve gradually until you hear noticeable sound due to increase in R.P.M.. Remove the glo-starter from the engine with care so that it dose not touch the rotating propeller. Now the engine should keep running. If it stop, close the needle valve a little further, and re-start the engine. Close the needle valve about 1/8 turn, and feel the change of R.P.M.. After the R.P.M. are increased, close it another 1/8 turn at a time and feel the next change of R.P.M..

As the R.P.M. of the engine dose not instantly change with needle valve adjustment, slowly lean the needle setting until the R.P.M. slow down. Back to where the peak R.P.M. position is. At that point, richen the needle setting slight until you hear a slight (but noticeable) decrease in R.P.M. You should never set your engine for peak R.P.M. on the ground, as the mixture always leans out slightly in flight due to the "unloading" of the propeller in the air.

STOP YOUR ENGINE

Cut off the fuel supply to the carburetor by pinching close the fuel line or disconnect the fuel line when your engine run at lowest R.P.M.. You may also adjust the throttle linkage via your radio control unit to close the air supply.

CAUTION
Do not use your hands, fingers, any parts of your body, or throw any object into the propeller to stop the engine. Be care not to touch the rotating propeller and the hot engine.

BREAK-IN/RUN-IN PROCEDURES

Because your Thunder Tiger GP engine has been precision-made from quality materials and is an ABC type engine, a prolonged break-in period is not necessary. In fact, after a tank or so on the ground, your engine can be flown to break it in. We strongly recommend a fuel containing 20% castor oil or castor/synthetic blend with no more than 10% nitromethane be used for break-in. We strongly discourage using fuel containing only synthetic lubricants during the initial break-in period. The break-in period can take place on your model or on a test stand. Many companies offer good quality, low cost engine test stands, should you choose to bench-run your engine prior to installation in the aircraft. Never use a vise for break-in as this can distort the crankcase and ruin your engine. Refer to the table of propeller suggestted above to determine the proper size for break-in. Install the propeller securely to the engine, connect the fuel lines, and fill the fuel tank. Install a long reach R/C glow plug in your engine.

Turn the needle valve clockwise to the fully closed position and back counter-clockwise about 2~2-1/2 turns. All adjustments during break-in will be made to the needle valve only. Start your engine as described above. Open the throttle fully. Let the engine run rich for a minute or two, then close the needle valve 1/4 turn (clockwise) and disconnect the battery from the glow plug. Allow the engine to consume the entire tank of fuel at this needle setting, and make sure that the engine remains "rich". After the first tankfull, allow the engine to cool for a few minutes before refilling the tank and restaring. During the second tank of fuel, run the engine at alternate throttle settings (i.e. 1/2 throttle for 30 seconds, then full throttle for 30 seconds, etc.) for about half the tank. Advance the throttle to full, and slowly lean the needle setting (about 1/8 turn at a time) until you reach peak R.P.M.. At that point, richen the needle setting about 1/8 turn (counter-clockwise) and allow the balance of the fuel to be consumed. After allowing the engine to cool, and re-filling the tank, run a third tank of fuel at this needle setting, alternating throttle position every 30 seconds to 1 minute between 1/4,1/2, 3/4 and full throttle.

At this point, your engine is ready for its first flights. Attach the proper propellor for your aircraft. Start your engine and re-adjust the needle valve for peak R.P.M., then richen the needle slightly. After 4~5 flights, your engine will be completely broken-in and running consistently. If you experience any difficulty with idle settings , please refer to the carburetor adjustment as next section.

CABRURETOR ADJUSTMENT

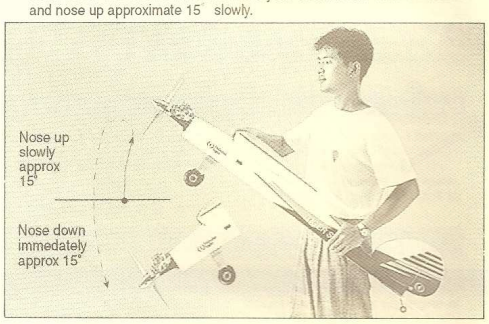
The air-bleed carbruetor with a throttle rotor and an air-bleed screw provides a wide range of engine speed control from idling speed to full power. The throttle rotor with the throttle lever linked to a servo under the control of R/C system in your model will enable engine speed to be varied. As the carburetor of your engine has been factory set for approximate the best running with fuel tank is correctly located as previously described, it should not be required to adjust anything except the needle valve. After the engine has been broken-in, check the operation of the throttle according to the following and re-adjust the air-bleed screw when necessary.

THROTTLE-STOP SCREW ADJUSTMENT

1) Start the engine and open the throttle fully.
2) Adjust the needle valve to the best position.
3) Close the throttle gradually from the highest speed to the lowest possible.
4) Find and fix the idling position where the lowest possible R.P.M. with steady running is obtained by means of the "throttle trim" on your transmitter or by screwing the throttle-stop screw without risk of the engine stopping.
5) Open the throttle fully and make sure that the engine runs at the highest speed, or else (i.e. your engine stops) re-set the idling position at a little higher R.P.M..
6) Keep running at the highest speed for about 10 seconds, then close to the lowest speed abruptly. Run at idling for about 5 seconds and make sure it does not stop, or else re-set the idling position at a little higher.
7) Repeat the procedure 5) abruptly, then the procedure 6) for few times to ensure the best running is obtained. If your engine stop in the middle range or it is not the best to speed up from idling to full power, please adjust the air-bleed screw as follows:

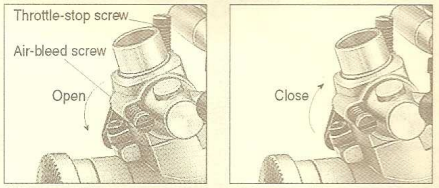
AIR-BLEED SCREW ADJUSTMENT

1) Start the engine and open the throttle fully.
2) Adjust the needle valve to the best position.
3) Close the throttle gradually from the highest speed to the lowest possible.
4) Find and fix the idling position where the lowest possible R.P.M. with steady running is obtained by means of the "throttle trim" on your transmitter or by screwing the throttle-stop screw without risk of the engine stopping.
5) In order to determine which way to adjust, determine firstly the present condition of the idle fuel mixture. Hold your aircraft with arms as illustrated and nose up approximate 15° slowly.



CONDITION 1

If the engine runs unevenly or stops, nose down your aircraft immediately approximate 15° .The engine should run steadily. Stop the engine by pinching the fuel line and close (clockwise) the air-bleed screw about 1/2 turn. These adjustment can be made without stopping the engine. However, it is advisable for beginners to stop the engine for safety reasons.



CONDITION 2

If the idling runs up, open the air-bleed screw about 1/2 turn.

6) Re-start the engine, and repeat from the procedure 3) to 5) until a steady idle is obtained.

NOTE

After the needle valve is adjusted on procedure 2), do not attempt to adjust it again.

ENGINE CARE

Always keep the outside of your engine clean.Use clean, fresh fuel and keep your fuel can, pump,and fueling system free from dirt particles. Install a fresh fuel filter between the fuel tank and carburetor, and between your fuel pump and filling line to provent any potential of dirt entering your engine.
Model fuel contains alcohol, which is hygroscopic (meaning that it attracts moisture from the atmosphere).This can cause corrosion to the internal engine parts. After each flying session, run all the fuel out from inside the engine and disconnect the fuel line from the carburetor.Put 4 or 5 drops of after-run oil (Marvel Mystery Oil, Prather, Pacer, etc.) into the carburetor and turn the propeller over by hand several times to protect the engine bearings and internal parts from corrosion.
The use of after-run oil is also important during periods of prolonged storage (such as winter). We suggest removing the engine from the model, and liberally applying oil into the carburetor and glow plug hole, wrap your engine in a soft cloth and store in a sealed plastic bag.
Do not dismantle your engine unnecessarily, as this may upset precision fits such as piston/cylinder and crank pin/connecting rod assembly. If it is necessary to clean your engine completely (such as after a crash), remove only the carb (do not disassemble), muffler, backplate, and cylinder head. Flush the entire engine with fresh fuel and reassemble.Apply after-run oil to the engine and store or re-install into the model.Do not dissemble your engine further than described above,or your warranty may be voided!

THUNDER TIGER 3 YEAR LIMITED WARRANTY

Your engine is guaranteed to be free from defects in materials and workmanship for a period of 3 years from the date of purchase when returned for service accompanied by proof of purchase (register receipt, credit card invoice, etc.). Crash damage or problems caused by improper use are specifically not covered under this warranty. Damage caused by customer disassembly, use of improper or substandard fuel, use of improper accessories (such as propellers, glow plugs, etc.) or any use of the product other than its specific intended use will automatically void this warranty.

SERVICE PROCEDURES

Should your Thunder Tiger engine require service, please follow the following guidelines:

1) Do not return the engine to the place of purchase, as they are not authorized or equipped to perform service.
2) Remove the engine from the model. We cannot accept equipment for service other than the engine.
3) Along with your engine and proof of purchase, enclose a complete written explanation detailing the problem(s) with your engine. Be sure to include your name, address and daytime telephone number.
4) For repairs not covered under warranty, the charges will be billed to you C.O.D. Please mention if you wish to have an estimate of non-warranty repair charges prior to us beginning service. (This may cause a slight delay in your repair.)
5) For customers outside of the U.S. and Canada, contact the authorized Thunder Tiger agent in your country.
6) For U.S. and Canadian customers, send your engine via insured mail or U.P.S. to the Thunder Tiger U.S.A..

Thunder Tiger

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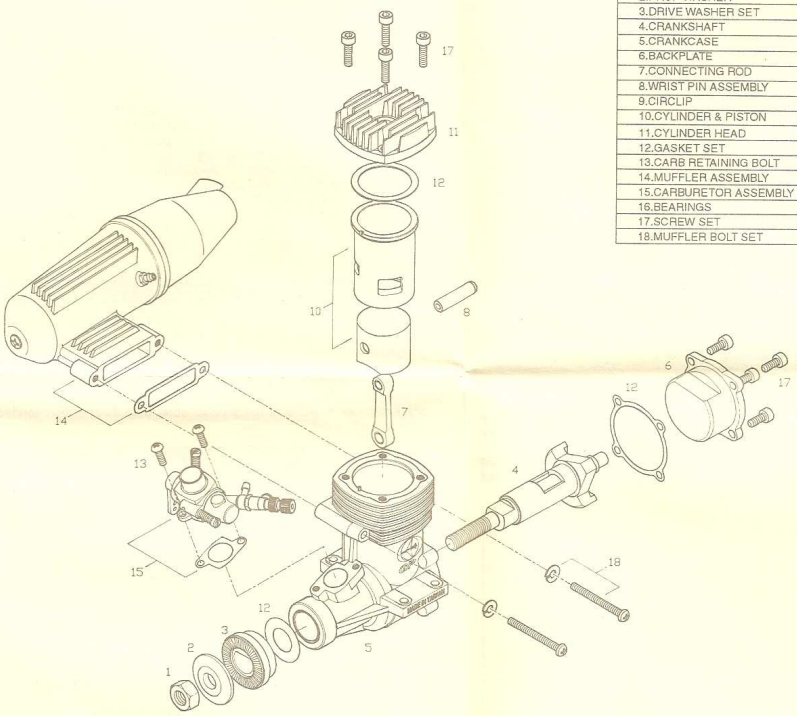
JA0309 Printed in Taiwan R.O.C.

PARTS LIST / ENGINE

ITEM NO. DESCRIPTION	9041 GP-42
1.PROP NUT	AA0025B
2.PROP WASHER	AA0026B
3.DRIVE WASHER SET	AA0577
4.CRANKSHAFT	AA0578
5.CRANKCASE	PN0161
6.BACKPLATE	AA0575
7.CONNECTING ROD	AN0033
8.WRIST PIN ASSEMBLY	AN0581
9.CIRCLIP	******
10.CYLINDER & PISTON	AN0579
11.CYLINDER HEAD	AA0576
12.GASKET SET	PN0162
13.CARB RETAINING BOLT	PN0163
14.MUFFLER ASSEMBLY	9211
15.CARBURETOR ASSEMBLY	9224
16.BEARINGS	******
17.SCREW SET	PN0164
18.MUFFLER BOLT SET	PN1511



PARTS LIST / CARBURETOR

DISCRIPTION OF PARTS	9224
A.CARBURETOR BODY w/ROTOR	PN1110
B.CARBURETOR BODY	AN1231
C.NEEDLE VALVE ONLY	PN1111
D.THROTTLE-STOP SCREW SET	PN1061
E.NEEDLE VALVE ASSY	PN1112
F.THROTTLE LEVER	PN1065