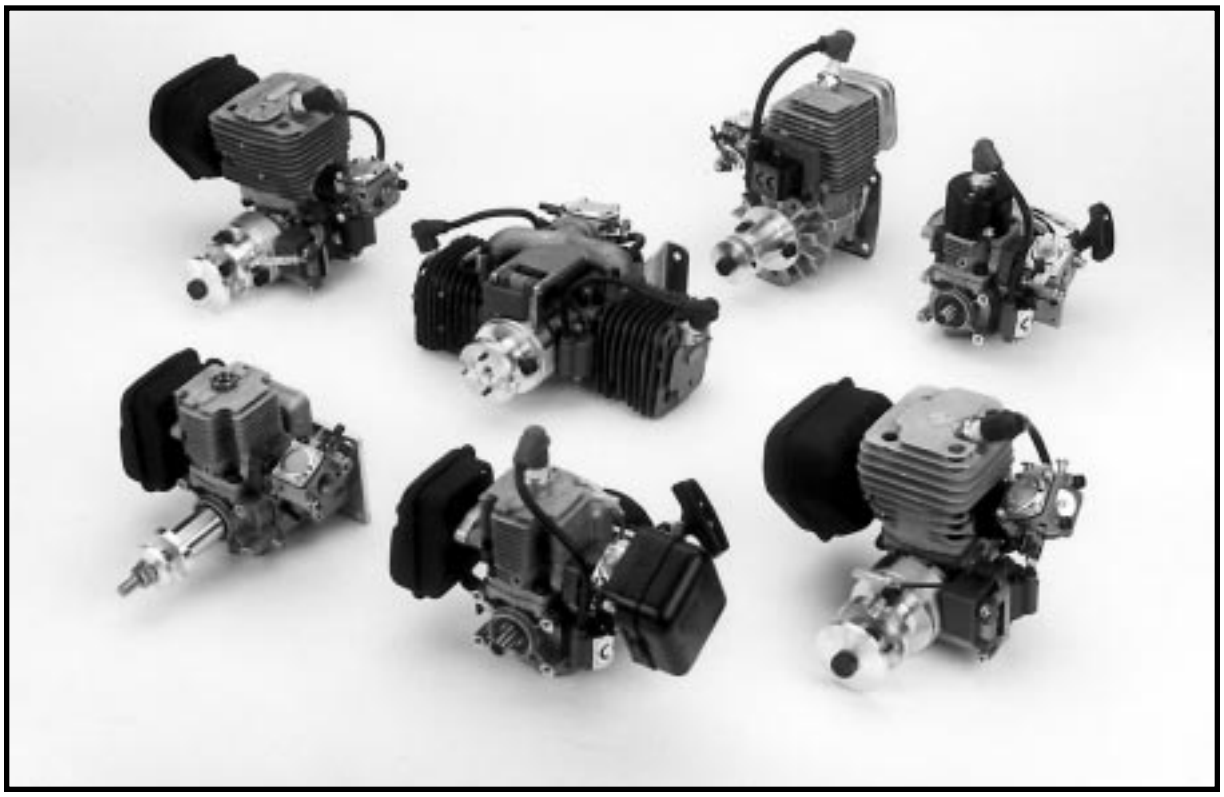
ZENOAH

ENGINE INSTRUCTION MANUAL



Model:

G-23 Air/Heli/Marine
G-23 Glow
G-38
G-62
G-45
G-445 Twin

VERY IMPORTANT:

FAILURE TO READ AND FOLLOW THESE INSTRUCTIONS BEFORE YOU PROCEED MAY RESULT IN ENGINE DAMAGE AND THE VOIDING OF YOUR WARRANTY!

INTRODUCTION

Congratulations on purchasing a Zenoah engine. Cared for properly, these high-quality, finely crafted engines will offer many years of reliability.

This instruction manual has been developed to ensure optimum performance from the Zenoah engine you have purchased. It's important that the instructions are read thoroughly prior to mounting and running the engine.

SAFETY INSTRUCTIONS

This manual describes the engine's features and functions. For specific information on mounting, see the instruction manual included with the model airplane, helicopter, or boat in which you intend to install the engine.

This model engine will give you considerable pleasure, satisfaction and performance if you strictly follow these safety instructions and take heed of the warnings as to the engine's safe and proper use. Remember at all times, this engine has more than enough power to cause harm if misused or if the safety precautions are not observed.

YOU SHOULD ALWAYS:

1. Use genuine parts for replacement.
2. Check the propeller, rotor (helicopter) or screw propeller (boat) prior to each time the engine is used. If nicked, scratched, cracked, or damaged in any way, replace it with a new one.
3. Use the correct size and pitch of propeller for your engine; refer to the propeller chart in this manual.
4. It is extremely important to balance the propeller prior to installation of the engine. Failure to do so may cause damage to the Zenoah engine and/or the airframe. Securely tighten the propeller nut against the washer and propeller.
5. Inspect the tightness of the propeller nut prior to each flight.
6. Keep your face and body away from the path of the propeller blades when starting or running your engine.
7. Use a thickly padded glove when hand starting the engine.
8. Make all carburetor adjustments from behind the propeller.
9. To stop the engine, the black lead wire from the coil should be grounded to the engine body, or use the throttle linkage to shut off the air by closing the throttle valve completely.

   DO NOT USE HANDS, FINGERS OR ANY OTHER PART OF THE BODY TO STOP THE PROPELLER. DO NOT THROW ANY OBJECT INTO A PROPELLER TO STOP IT!
10. Ensure that all spectators, especially children, are at least 20 feet away when you start running the engine.
11. Make sure your fuel is kept in a safe place well away from sparks, heat or anything that could ignite the fuel.

IT IS HIGHLY RECOMMENDED THAT:

1. Safety glasses or goggles be used when starting and running your engine.
2. You do not run the engine in the vicinity of loose gravel or sand. The propeller may throw such materials into your eyes. The engine could also ingest these harmful materials.
3. Loose clothing should be avoided when operating your model engine, as it could become entangled in the propeller, creating the possibility of bodily harm. Also, all loose objects (screwdrivers, pencils, nickel cadmium glow drivers, etc.) should be removed from your pockets so that they do not fall into the propeller.

CAUTION:

1. Model engines get very hot while running. Do not attempt to handle them until they have cooled.
2. Always run your model engines in a well-ventilated area. Similar to automotive engines, model engines produce harmful carbon monoxide fumes.
3. Never modify the flywheel.
4. Check the flywheel. If it's damaged, replace it with a new one.
5. When mixing the fuel or operating the engine, do so in a well-ventilated area
6. Remember that model engines produce a substantial amount of power, more than enough to seriously injure people and/or do considerable damage to property. Always use common sense, skill and constant observation of safety precautions.

DISASSEMBLY

The Zenoah engine can be disassembled or reassembled without any specific difficulties. Refer to the Engine Maintenance Section for specific instructions on these procedures. If you need service to your Zenoah engine, please send your engine to the authorized service center at the following address:

Horizon Hobby Distributors
Attention: Zenoah Service
4105 Fieldstone Road
Champaign, IL 61822
Phone: (217) 355-9511

ENGINE PARTS IDENTIFICATION

It's important to be able to identify the parts of your Zenoah engines. Attached you will find an exploded view of Zenoah engines, as well as a chart including part numbers and descriptions. This will assist you in easily and rapidly identifying the respective parts of your Zenoah engine.

SUPPORT EQUIPMENT

The following items, which are not included with your Zenoah engine, are necessary in order to operate the model engine.

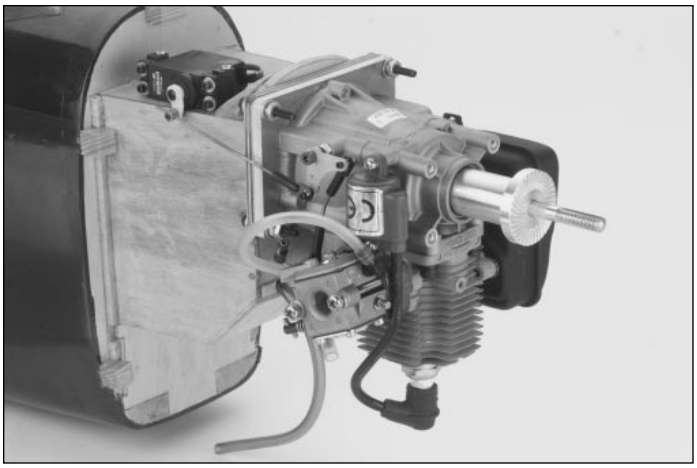
Fuel—Mix gasoline and 2-stroke oil at a mixing ratio of 25-40:1. **Note:** Be sure to use a gasoline-resistant fuel tubing (do not use any silicone rubber tube). Never use any alcohol fuel or alcohol-added fuel as this will damage the rubber part of the carburetor. **Note:** An exception to this is the G-23 Glow engine, which uses a different carburetor. This engine should be operated with any high quality two-stroke model airplane fuel with a Nitro content of between 10-15%.

Propeller—Refer to the Propeller Selection Chart located on page 8 to determine the best initial propeller for your particular application.

Manual or Electric Starter—For manual starts, a "chicken stick" is highly recommended. **Never** use your fingers to start any model engine as you could get injured. If you must hand start a gasoline engine, be sure to protect your hand with a heavily padded glove. There are a variety of heavy-duty electric starters on the market that can be used.

MOUNTING THE ENGINE

Make sure the engine is mounted on the aircraft using aircraft grade plywood that's at least 6mm in thickness for the G-23 engine, and 10mm in thickness for the G-38 through G-445 twin, or a mount of equivalent strength. Make sure it's firmly mounted with 4 bolts.



Note:

1. Be sure to set flat washers or a metal plate on the reverse side of the mount to prevent the bolts from sinking into the mount. Periodically check the engine mount for loose bolts.
2. Since the engine is equipped with a float-less carburetor with a diaphragm pump, the direction of the cylinder and position of the fuel tank can be freely selected.
3. If the engine is mounted on a shock (rubber) mount placed between the engine and the firewall for anti-vibration, check the hardness of the rubber, making sure it's not too soft, in order to avoid excessive vibration during engine operating rpms. It's suggested you note carefully if the engine is vibrating at idle as excessive vibration can result in erratic engine operation due to overflow at the carburetor.
4. It is suggested you coat the bolts for the muffler with thread lock (e.g., Blue Thread Locker Z-42 or equivalent) when mounting the muffler to the engine.

BREAK-IN

No specific break-in is required. The engine is gradually broken-in as it is used, and the output power increases gradually as the engine breaks in.

OPERATION

STARTING THE ENGINE—AIRCRAFT

Before attempting to start the engine, be sure to read through all the steps for starting the engine as outlined below:

Zenoah engines are equipped with the ultra compact C.D.I. type flywheel magneto ignition system and should be started according to the following procedure:

Note: The magneto system is timed in such a way that when the compression stroke starts (refer to Figure 1-A) sparks are never produced on the spark plug, no matter how fast the propeller is flipped. The correct starting procedure is to *quickly flip the propeller when the edge of the magnet on the rotor is approaching the coil (Figure 1-B).* This means that the propeller should be quickly flipped at about 90 degrees in crank angle before the compression stroke is about to start.

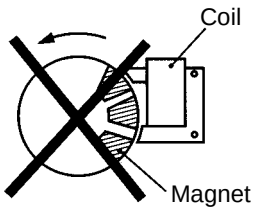


Fig 1-A

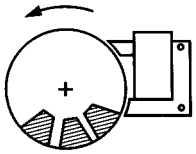


Fig 1-B

1. Make sure the spark (glow) plug(s) are installed and tightened. Check the condition of the plug cap for cracks or breaks.
2. Be sure the propeller is properly secured.
3. Make sure the fuel tank line(s) are properly connected. The main line should be connected to the carburetor spray bar.
4. Be certain the mufflers are installed properly.
5. Fill the fuel tank.
6. Choke the engine and turn the propeller through a few times until the fuel appears at the carburetor.

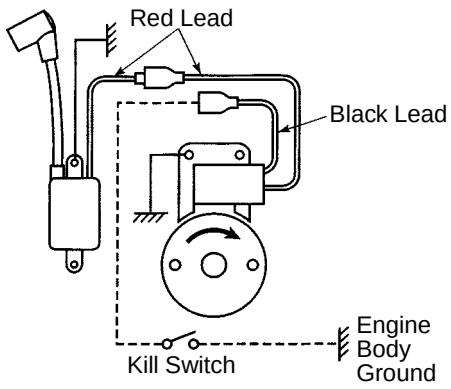
7. Set the throttle valve at the idle position or at the position slightly open from idle.
8. Quickly flip the propeller in a counterclockwise direction according to the procedure described in the note above.
9. The engine should start after a few flips of the propeller.
10. Be sure to open the choke when the initial firing of the engine is heard.
11. When the choke is opened, be sure to close the throttle valve to a position near the idle position before the next flipping of the propeller is attempted. **CAUTION:** *If the engine is started when the throttle is wide open, a great thrusting force will be generated, which can be very dangerous.*
12. If you do not use a chicken stick to start the engine, be sure to wear a thick glove when flipping the propeller and use all fingers, except the thumb, for the flipping operation.
13. Do not over-rev the engine. These engines are designed to develop maximum output with the standard muffler and the recommended propeller size. Please refer to the propeller chart on page 8 to confirm the proper propeller for the applicable Zenoah engine.

STARTING THE ENGINE—HELICOPTER AND BOAT

1. Fill the tank with fuel
2. Push the priming bulb located on the carburetor until fuel appears in the priming bulb (for helicopter).
3. Choke the engine and open the throttle valve approximately 1/3–1/2 of the full open position.
4. Quickly pull the starter cord until the initial firing of the engine is heard.
5. When the initial firing is heard, open the choke, set the throttle valve at the idle position or at the position slightly open from the idle position and quickly pull the starter cord a few more times until the engine starts.
6. For helicopter operation, you should adjust the rotor-pitch to obtain a 9,000 to 10,000 rpm of the engine at full throttle operation.

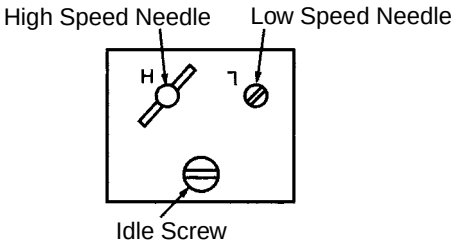
HOW TO STOP THE ENGINE

The ability to shut down the engine in an emergency is extremely important. For stopping the engine, the black lead wire from the coil should be grounded to the engine body, or the throttle valve should be closed completely. Installation of a “stop” or “kill” switch is recommended. Refer to the example shown in the following diagram.



CARBURETOR ADJUSTMENT

The carburetor is provided with three adjustment screws, which are factory set to the best (approximate) positions. They may need minor adjustment, depending upon the temperature, humidity, atmospheric pressure (altitude), etc., of the area where the engine is being used.



1. Start the engine without making any adjustments.
2. Make adjustments only when the engine shows signs of inefficient operation.
3. Standard settings of each needle is as follows:
   a. Low Speed Needle: 1⅛ plus/minus ¼
   b. High Speed Needle: 1⅜ plus/minus ¼

Idle Screw: Turning this screw clockwise increases the idling RPM. Turning it counterclockwise decreases the idling RPM.

Low Speed Needle: This is the fuel adjust screw (not the air screw). Turning this needle clockwise makes the gas mixture leaner, and turning it counterclockwise makes it richer.

High Speed Needle: Turning this needle clockwise makes the gas mixture leaner, and turning it counterclockwise makes it richer. Set this needle at a position which is ¼ open from the maximum rpm position while the aircraft is on the ground.

Note:

1. Do not tighten the high and low speed needles too tightly.
2. When the engine has just started and is not warm enough, there may be insufficient acceleration and the

engine may die. Be sure to allow the engine to warm up at idle for a few minutes before conducting normal operation.

TIPS FOR EXTENDED ENGINE LIFE

To extend the life of your Zenoah engine, the following is recommended:

1. Use a high quality 2-stroke oil mixed at 32 to 1.
2. Use the recommended spark (glow) plugs.
3. Use the proper propeller size and balance the propeller prior to use.
4. Always adjust the engine to a slightly rich setting.
5. For Glow engines, use an “after-run” oil when you’re finished flying for the day.
6. For long-term storage, make sure there is no fuel left in the tank or the engine. Remove the spark (glow) plug(s) and apply several drops of high-quality oil (e.g., Marvel Air Tool Oil) to the top of the engine and into the spark (glow) plug hole. Rotate the crankshaft several times. Store the engine in the box it came in or on the airplane with the nose down in order to keep oil in the bearings.

SERVICING THE ENGINE

Tools Required:

- Regular screwdriver
- Phillips screwdriver
- Hexagonal wrench (4mm/5/32”)
- Open wrench (19mm/3/4”)
- Plastic hammer
- Thickness gauge
- Tapered round rod
- Liquid gasket (Permatex or equivalent
- Thread lock (Blue Thread Locker Z-42 or equivalent)
- Lithium grease
- Engine oil
- Washing gasoline
- Brush
- Scraper
- Cloth

The engine can be disassembled or reassembled without any specific difficulties, but note the following:

For disassembling, the special tools shown in the parts list are required (stopper, puller assembly), in addition to general tools. Be sure to use a new gasket when the crankcase and cylinder have been disassembled.

Note: Because the crankshaft is of the assembly type, do not disassemble, hit or twist its end.

DISASSEMBLY STEPS

Note: Disassembly and assembly steps were written using a G-38 engine as an example, but they apply to all engines.

1. Dismount the engine from the model.
2. Remove the carburetor and insulator carefully without damaging the gasket.
3. Remove the muffler.
4. Remove the spark plug and ignition module. **(Note:** The glow engine does not have an ignition module.)
5. Remove the propeller hub.
6. Remove the rotor (flywheel). If it cannot be detached, use a plastic hammer and hit the part lightly.
   a. Screw the stopper in place of the spark plug, then turn the rotor counterclockwise until the piston touches the stopper. Take care as it can cause damage to the piston or connecting rod if the stopper is not screwed in to the bottom.
   b. Loosen and remove the rotor securing nut.
   c. Remove the rotor by using the puller. Do **not** hit the crankshaft with the plastic hammer, as this can increase the runout of the shaft.
7. Remove the mounting plate.
8. Remove the four bolts from the crankcase.
9. Tap around the case fitting side gently with the plastic hammer and slowly separate the crankcase from the cylinder block.
10. Pull out the crankshaft with the piston, bearings, and other parts attached.
11. Remove the Woodruff key from the crankshaft.
12. Remove the oil seal, snap ring and bearings.
13. Remove the circlip and pull out the piston pin.
14. Remove the thrust washers and needle bearing from the smaller end of the con rod (G-38).
15. Remove the piston ring.
16. Wash each part. Check for abrasion and damage, and replace any part that is defective.

ASSEMBLY (G-38)

1. Apply engine oil (SAE #30) to the inside of the cylinder and to the needle bearings on the larger end of the connecting rod.
2. Fit the piston ring to the piston.
3. Mount the needle bearing and thrust washer (with its oil slot facing inside) to the smaller end of the connecting rod and apply engine oil (SAE #30).
4. With the arrow on the top of the piston facing the straight side (opposite side to the propeller) of the crankshaft, fit the piston to the top of the connecting rod and insert the piston pin with its blank end to the exhaust port side.

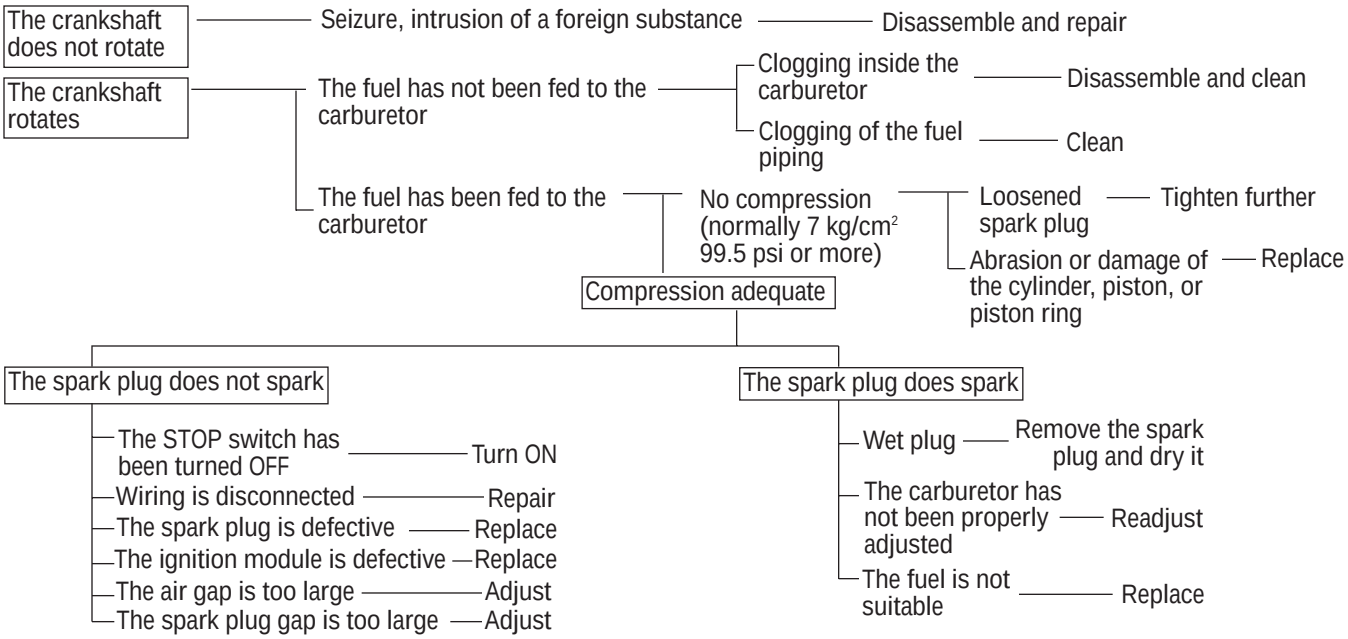
5. Fit the circlip.
6. Fit the bearings, snap ring and oil seal to the crankshaft. (Apply lithium grease to the lip area of the oil seal and fit it, paying attention to its direction.)
7. Wipe the contact surfaces of the cylinder block and crankcase, and apply liquid gasket (Permatex or equivalent).
8. Put the piston in the cylinder, with the piston's arrow facing in the exhaust port direction. Set the crankshaft to the cylinder block. When this is done, fit the oil seal to the cylinder block. Also, the snap ring joint should be set vertically to the cylinder.
9. Fit the crankcase to the cylinder block and tighten the bolts.
10. Check that the crankshaft can be smoothly turned by hand.
11. Put back the Woodruff key.
12. Replace the rotor (flywheel), fitting it to the Woodruff key. Tighten the hub nut after having applied thread lock (Blue Thread Locker Z-42 or equivalent) to the threads.
13. Apply thread lock (Blue Thread Locker Z-42) to the muffler bolts and mount the muffler.
14. Apply thread lock (Blue Thread Locker Z-42) to the ignition module set screws and fix the coil temporarily.
15. Set the rotor (flywheel) so that the magnet is located on the opposite side of the module (G-38). Place a thickness gauge between the core of the module and rotor (flywheel) and adjust the clearance to 0.25 ^ 0.35 mm (0.01 ^ 0.014 in). Then tighten the set screws after having applied thread lock (Blue Thread Locker Z-42) to them.
16. Using a new gasket, fix the insulator with screws to which thread lock (Blue Thread Locker Z-42) has been applied.
17. Using a new gasket, mount the carburetor with screws, paying attention to its mounting direction.
18. Tighten the mounting plate, using screws with thread lock (Blue Thread Locker Z-42) applied.
19. Install the spark plug.

TROUBLESHOOTING

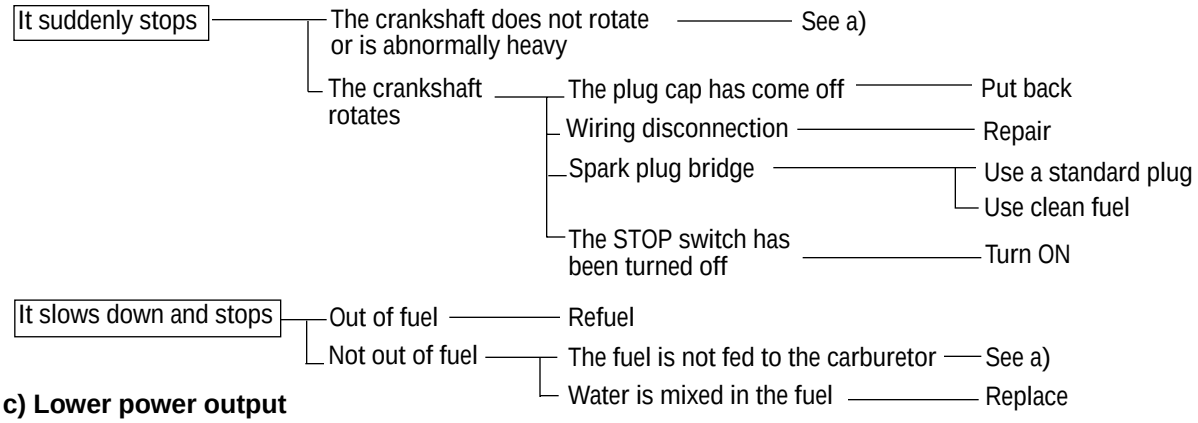
Generally speaking, there are very few things that will keep today's modern engines from starting. To that end, make sure you're using good quality "fresh" fuel, that good glow plugs are installed, and the starting battery (glow) is charged and in good condition. Should the engine fail to start after these items are verified, refer to the following chart(s):

GASOLINE ENGINES:

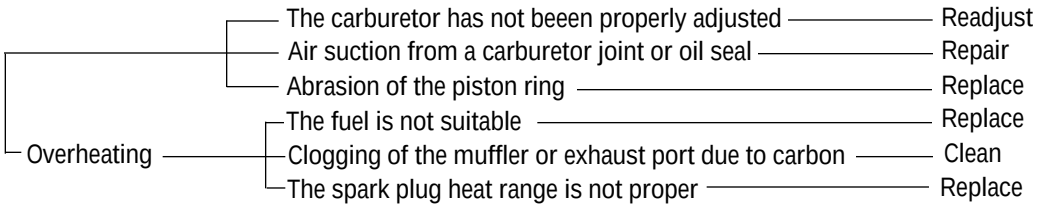
a) The engine does not start.



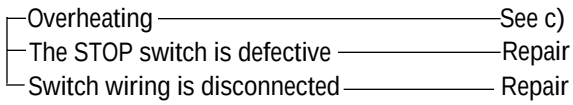
b) The engine stops by itself



c) Lower power output



d) The engine does not stop



GLOW ENGINE:

SYMPTOM	CAUSE	CORRECTIVE ACTION
Engine fails to Start	Low voltage on starting battery (glow)	Replace/recharge the starting battery (glow)
	Bad glow plug(s)	Inspect/replace bad glow plugs
	Insufficient priming	Repeat priming procedure
	"Flooded" due to excessive priming	Disconnect battery, remove glow plugs (glow only) and rotate propeller several times to "clear" cylinder(s)
Engine fires but does not run	Over primed	Disconnect battery (glow) and rotate propeller several times to "clear" cylinder(s)
Engine starts but slows down and then stops	Mixture too rich	Close high speed needle valve 1/2 turn and start again. Repeat until engine is running smoothly.
Engine starts, speeds up, and then quits	Mixture too lean	Open high speed needle valve 1/2 turn and start again. Repeat until engine is running smoothly.
Engine quits when starter battery is removed	Mixture too rich	Close high speed needle valve 1/2 turn and restart.
	Incorrect glow plugs	Change glow plugs
	Incorrect or bad fuel	Change fuel

In the event that none of the above procedures results in the engine running properly, contact our service department for suggestions at:

Horizon Hobby Distributors
4105 Fieldstone Road
Champaign, IL 61922
Phone: 217-355-9511 (Mon-Fri 8:00-5:00 CST)

PROPELLER SELECTION

In the chart at right you'll find a propeller selection list. This chart enables you to select the best propeller for initial set-up of your Zenoah engine.

Remember, it's imperative to balance each propeller prior to installation onto your Zenoah engine. Failure to do so may cause unwanted vibration in your aircraft.

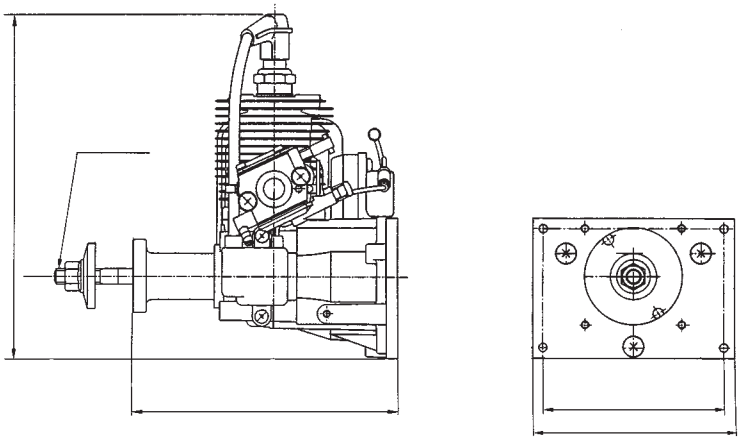
PROPELLER CHART

Note: All recommendations are based on engines using APC brand props.

Engine		
G-23A	15x8 @ 9,000	
G-23 Glow	17x8 @ 7,200	
G-23 Heli	Adjust pitch of rotor to obtain 9,000–10,000 rpm of the engine at full throttle	
G-23 Marine	Diameter = 65–75mm	Pitch ratio 1.9–1.4mm*
G-38 Gas	18x10 @ 7,300	
G-45 Gas	20x10 @ 7,200	
G-62 Gas	22x10 @ 7,200	
G-445 Gas	22x12 @ 7,200 24x10 @ 7,200	

CONSUMER WARRANTY AND REPAIR

ENGINE SPECIFICATIONS



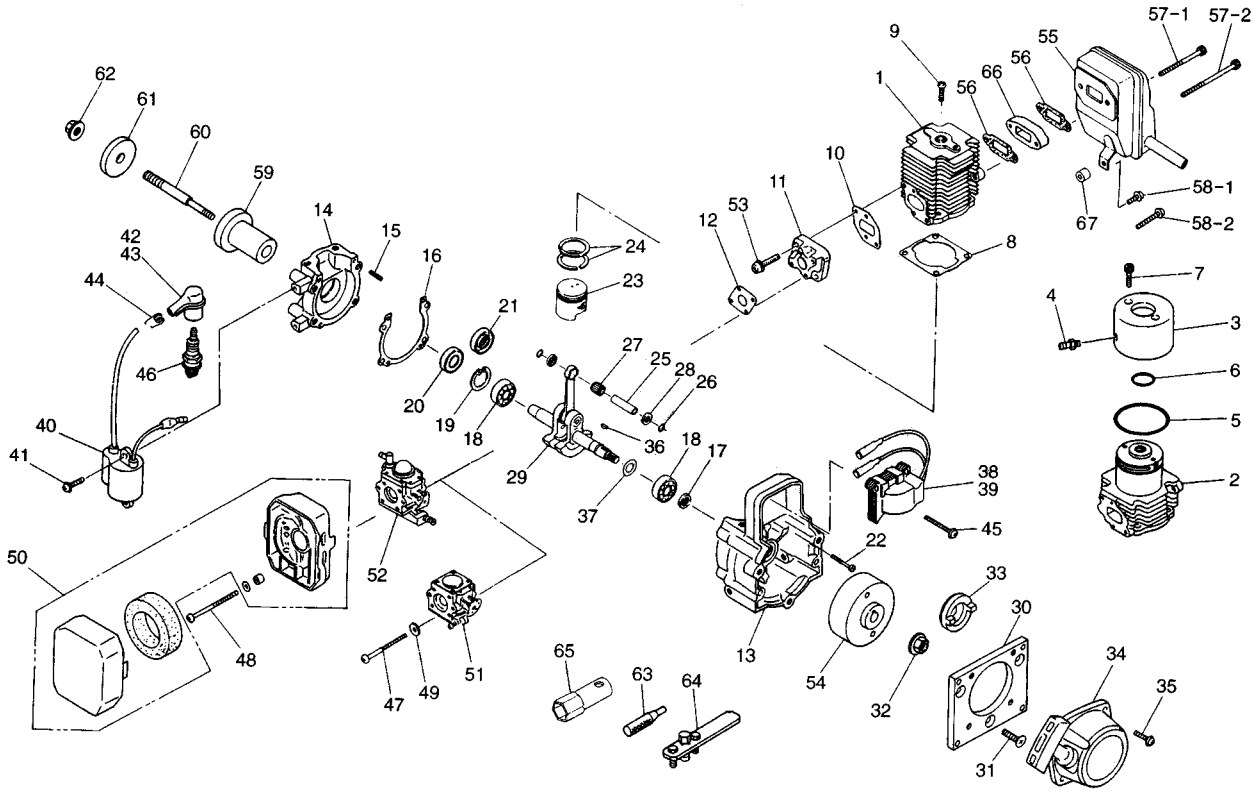
OUTSIDE DIMENSIONS (MM)

Items	Length	Width	Height	Operating RPM	Optional Mufflers
G-23	139mm	105mm	179mm	2,000–10,000	BIS07123
G-23 GLOW	139mm	105mm	179mm	2,000–10,000	BIS07123
G-23 HELI	142mm	105mm	179mm	3,000–11,000	—
G-23 MARINE	142mm	105mm	179mm	3,500–15,000	—
G-38	170mm	130mm	215mm	2,000–9,000	BIS07138
G-45	152mm	130mm	185mm	2,000–10,000	BIS07145
G-62	162.5mm	140mm	185mm	2,000–10,000	BIS07163
G-445	191.5mm	257mm	190mm	1800–10,000	BIS07445/6

SPECIFICATIONS

	Displacement (cu. in.)	Bore (cu. in.)	Stroke (cu. in.)	Weight (oz.)	K (ISO)	HP (H/M)	Carb (walboro)
G-23	1.4	1.3	1.1	51	M8x1.25/6x1	2.0	WA197A/WA167A
G-23 Glow	1.4	1.3	1.1	37	M8x1.25	2.5	—
G-38	2.3	1.5	1.3	67	M10x1.25	2.2	WT338/WTA-6A
G-45	2.74	1.69	1.22	74	8x1	3.3	HDA-48D
G-62	3.8	1.9	1.4	73	10x1	4.75	HDA-48D
G-445	4.52	1.5x2	1.2x2	108	—	6	WJ-64

G-23



Note: The parts indicated "*" in the part number column are supplied as an assembly. No individual part available.
A=Aircraft, **H**=Helicopter, **M**=Marine

Index No.	Parts No.	Description	Q'ty per unit PU	PUH	PUM
1	ZEN2301	**A, H** CYLINDER	1	1	0
2	ZEN2302M	**M** CYLINDER	0	0	1
3	ZEN2303M	**M** JACKET	0	0	1
4	ZEN2304M	**M** JOINT	0	0	2
5	ZEN2305M	**M** O RING 3x38	0	0	1
6	ZEN2306M	**M** O RING 1.5x19.5	0	0	1
7	ZEN2307M	**M** BOLT M3x8	0	0	2
8	ZEN2308	GASKET CYL	1	1	1
9	ZEN2309	BOLT M5x20	4	4	4
10	ZEN2310	GASKET INSU	1	1	1
11	ZEN2311	INSULATOR	1	1	1
12	ZEN2312	GASKET CARB	1	2	1
	ZEN2314	CRANKCASE COMP	1	1	1
13	*	CRANKCASE (R)	1	1	1
14	*	CRANKCASE (F)	1	1	1
15	ZEN6213	CASE PIN	3	3	3
16	ZEN2316	GASKET CASE	1	1	1
17	ZEN2317	SEAL 12x22x7	1	1	1
18	ZEN2318	SHAFT BEARING	2	2	2
19	ZEN2319	RING SNAP	1	1	1
20	ZEN2320	SEALED BEARING	1	1	0
21	ZEN2321M	FRONT OIL SEAL	0	0	1
22	ZEN2322	CASE BOLT M5x30	4	4	4
23	ZEN2323	PISTON	1	1	1
24	ZEN2324	PISTON RING	2	2	2
25	ZEN2325	PISTON PIN	1	1	1

Note: * sold as an assembly

Index No.	Parts No.	Description	Q'ty per unit PU	PUH	PUM
26	ZEN2326	PIN RETAINER	2	2	2
27	ZEN2327	CONROD BEARING	1	1	1
28	ZEN2328	CONROD SPACER	2	2	2
29	ZEN2329	CRANKSHAFT	1	1	1
30	ZEN2330	PLATE MOUNT	1	1	1
31	ZEN2331	MOUNT SCREW CM5x6	3	3	3
32	ZEN2332	ROTOR NUT	1	0	0
33	ZEN2333M	**H, M** PULLEY	0	1	1
34	ZEN2334M	**H, M** PULL STARTER	0	1	1
35	ZEN2341	SCREW M4X14	0	4	4
36	ZEN6227	KEY	1	1	1
37	ZEN2337	SHAFT SPACER	0~2	0~2	0~2
38	ZEN6236	**A** SOURCE COIL (GRAY)	1	0	0
39	ZEN2339M	**H, M** SOURCE COIL (RED)	0	1	1
40	ZEN6237	IGNITION COIL	1	1	1
41	ZEN2341	SCREW M4x14	2	2	2
42	ZEN6238	**A** PLUG CAP (BLACK)	1	0	0
43	ZEN2343M	**H, M** PLUG CAP (RED)	0	1	1
44	ZEN6239	PLUG SPRING	1	1	1
45	ZEN6241	SCREW M4x22	2	2	2
46	ZEN2346	SPARK PLUG BMR74	1	1	1
47	ZEN2347	CARB SCREW M5x50	2	0	2
48	ZEN2348H	CARB SCREW M5x55	0	2	0
49	ZEN2349	CARB WASHER 5X10X1.6	2	0	2
50	ZEN2350H	**H** AIR CLEANER	0	1	0
51	ZEN2351	CARBURETOR 197A	1	0	0

Index No.	Parts No.	Description	Q'ty per unit PU	PUH	PUM
52	ZEN2352M	CARBURETOR 167A	0	1	1
53	ZEN2353	INSU SCREW M5x20	2	2	2
54	ZEN2354	NEW ROTOR	1	1	1
55	ZEN2355	**A, H** MUFFLER	1	1	0
56	ZEN2356	**A, H** MUFFLER GASKET	1	2	0
57-1	ZEN2357	**A** MUFFLER BOLT M5x50	2	0	0
57-2	ZEN2357H	**H** MUFFLER BOLT M5x60	0	2	0
58-1	ZEN2358	**A** SCREW M4x8	1	0	0
58-2	ZEN2358H	**H** SCREW M4x16	0	1	0
59	ZEN2359	PROP HUB	1	0	0
60	ZEN2360	PROP STUD	1	0	0
61	ZEN2361	PROP WASHER	1	0	0
62	ZEN2362	PROP NUT	1	0	0
63	ZEN6252	STOPPER (OPTIONAL)	1	1	1
64	ZEN6251	PULLER ASS'Y (OPTIONAL)	1	1	1
65	ZEN2365	SOCKET	1	1	1
66	ZEN2366	**H** MUFFLER SPACER	0	1	0
67	ZEN2367	**H** SPACER	0	1	0
	ZEN2370	GASKET SET	1	1	1
	ZEN2371	SCREW/NUT SET	1	1	1
	ZEN2372	CARB REPAIR KIT	1	1	1
	ZEN2384	STUD (MUFFLER)	1	1	1
	ZEN2392	TOOL SET	1	1	1
	ZEN2395	MARINE CLUTCH ASS'Y	1	1	1

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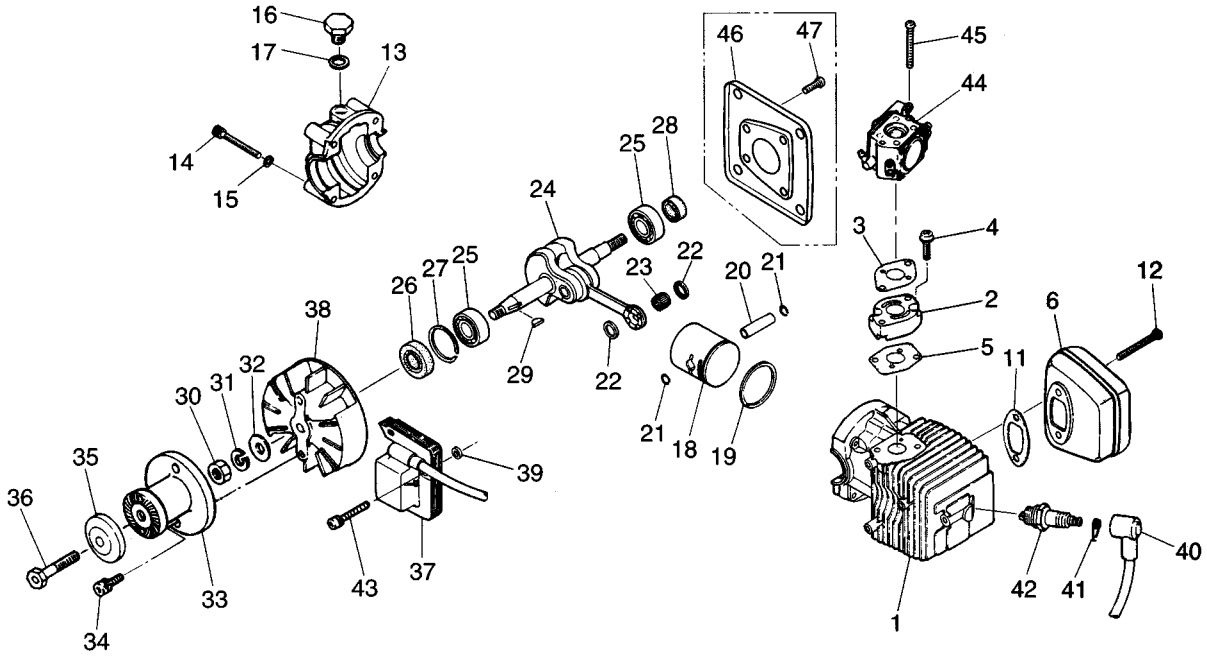
(Standard Accessory
for G380PU)



Index No.	Parts No.	Description	Q'ty/ unit
1	ZEN3801	CYLINDER	1
2	ZEN3802	INSULATOR	1
3	ZEN3803	CARB GASKET	1
4	ZEN3804	INSULATOR SCREW	2
5	ZEN3805	INSULATOR GASKET	1
6	ZEN3806	MUFFLER ASS'Y	1
11	ZEN3811	MUFFLER GASKET	1
12	ZEN3812	MUFFLER BOLT	2
13	ZEN3813	CRANKCASE	1
14	ZEN3814	CASE BOLT	4
15	ZEN3815	CASE WASHER	4
16	ZEN3816	CASE PLUG	1
17	ZEN3817	PLUG GASKET	1
18	ZEN3818	PISTON	1
19	ZEN3819	PISTON RING	1
20	ZEN3820	PISTON PIN	1

Index No.	Parts No.	Description	Q'ty/ unit
21	ZEN3821	PIN RETAINER	2
22	ZEN3822	CONROD SPACER	2
23	ZEN3823	CONROD BEARING	1
24	ZEN3824	CRANKSHAFT	1
25	ZEN3825	CRANKSHAFT BEARING	2
26	ZEN3826	FRONT OIL SEAL	1
27	ZEN3827	SNAP RING	1
28	ZEN3828	REAR OIL SEAL	1
29	ZEN3829	KEY	1
30	ZEN3830	ROTOR NUT	1
31	ZEN3831	LOCK WASHER	1
32	ZEN3832	ROTOR WASHER	1
33	ZEN3833	PROP HUB (NEW)	1
34	ZEN3834	HUB BOLT	2
35	ZEN3835	PROP WASHER (NEW)	1
36	ZEN3836	PROP BOLT (NEW)	2

Index No.	Parts No.	Description	Q'ty/ unit
37	ZEN3837	MODULE	1
38	ZEN3838	ROTOR (NEW)	1
39	ZEN3839	SPACER (MODULE)	3
40	ZEN6238	PLUG CAP (BLACK)	1
41	ZEN6239	CAP SPRING	1
42	ZEN6242	SPARK PLUG, C859	1
43	ZEN3843	MODULE BOLT	3
44-1	ZEN3844	CARB ASS'Y (HT-338) W/CHOKE	1
44-2	ZEN3850	CARB ASS'Y (WTA-6) W/O CHOKE	1
45	ZEN3845	CARB SCREW	2
46	ZEN3846	MOUNT } for G380PU	1
47	ZEN3847	MOUNTING BOLT } for G380PU	4
	ZEN3870	GASKET SET	1
	ZEN3871	SCREW/NUT SET	1

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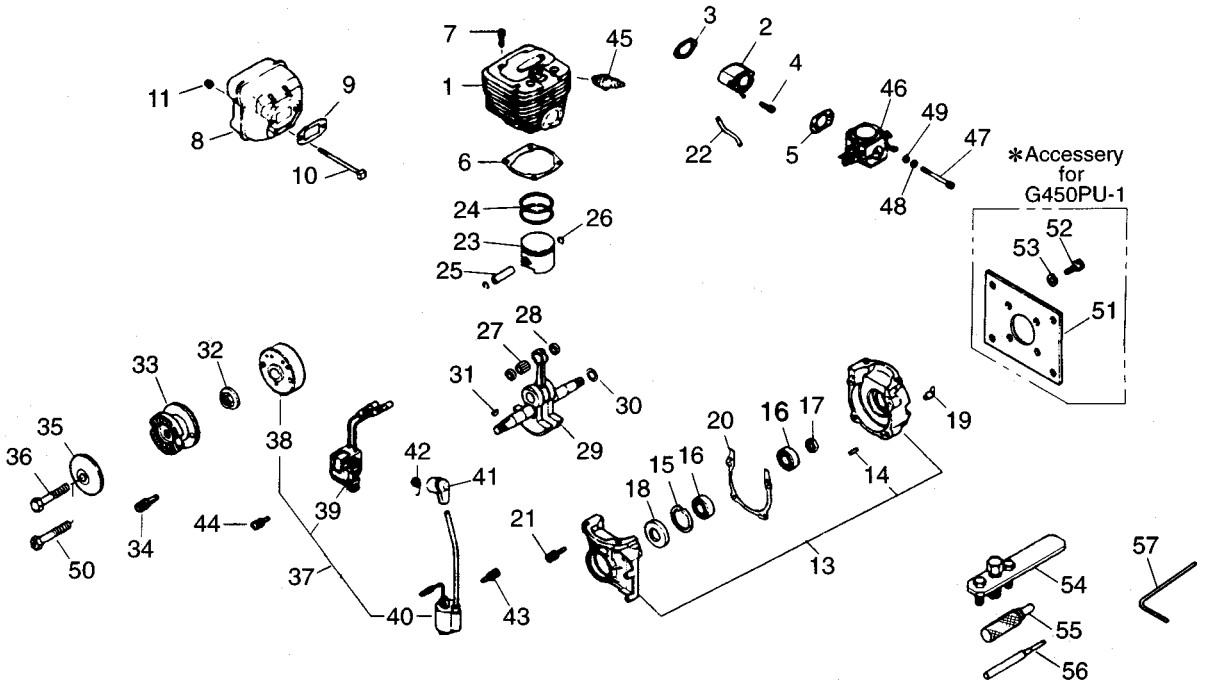

Index No.	Parts No.	Description	Q'ty/ unit
1	ZEN4501	CYLINDER	1
2	ZEN4502	INSULATOR	1
3	ZEN4503	INSULATOR GASKET	1
4	ZEN4504	BOLT	2
5	ZEN6204	CARBURETOR GASKET	1
6	ZEN4506	CYLINDER GASKET	1
7	ZEN4504	BOLT	4
8	ZEN6207	MUFFLER	1
9	ZEN6208	MUFFLER GASKET	1
10	ZEN6209	MUFFLER BOLT	2
11	ZEN6210	MUFFLER NUT	2
13	ZEN4513	CRANKCASE COMP.	1
14	ZEN6213	CASE PIN	3
15	ZEN6214	SNAP RING	1
16	ZEN6215	BEARING	2
17	ZEN6216	REAR OIL SEAL	1
18	ZEN6217	FRONT OIL SEAL	1
19	ZEN6276	ELBOW FUEL NIPPLE	1
20	ZEN4520	CASE GASKET	1

Index No.	Parts No.	Description	Q'ty/ unit
21	ZEN4504	BOLT	4
22	ZEN4522	PIPE	1
23	ZEN4523	PISTON	1
24	ZEN4524	PISTON RING	2
25	ZEN4525	PISTON PIN	1
26	ZEN6223	PIN RETAINER	2
27	ZEN6224	CONROD BEARING	1
28	ZEN4528	WASHER	2
29	ZEN4529	CRANKSHAFT COMP.	1
30	ZEN6228	SHIM	0-2
31	ZEN6227	KEY	1
32	ZEN6229	FLYWHEEL NUT	1
33	ZEN6230	PROP HUB	1
34	ZEN6232	HUB BOLT	2
35	ZEN6233	WASHER	1
36	ZEN6234	PROP BOLT	1
37	ZEN6257	MAGNETO ASS'Y	1
38	ZEN6235	ROTOR	1
39	ZEN6236	SOURCE COIL	1

Index No.	Parts No.	Description	Q'ty/ unit
40	ZEN6237	IGNITION COIL	1
41	ZEN6238	PLUG CAP (BLACK)	1
42	ZEN6239	CAP SPRING	1
43	ZEN4543	SOURCE COIL SCREW	2
44	ZEN6241	COIL SCREW	2
45	ZEN6242	SPARK PLUG	1
46	ZEN6243	CARBURETOR ASS'Y	1
47	ZEN4547	BOLT	2
48	ZEN6245	WASHER	2
49	ZEN6246	WASHER	2
50	ZEN6247	BOLT	1
51	ZEN6248	MOUNT * for G450PU	1
52	ZEN6249	BOLT * for G450PU	4
53	ZEN6250	WASHER * for G450PU	4
54	ZEN6251	PULLER ASS'Y	1
55	ZEN6252	STOPPER (OPTIONAL)	1
56	ZEN6253	GUIDE (OPTIONAL)	1
57	ZEN4557	WRENCH (OPTIONAL)	1

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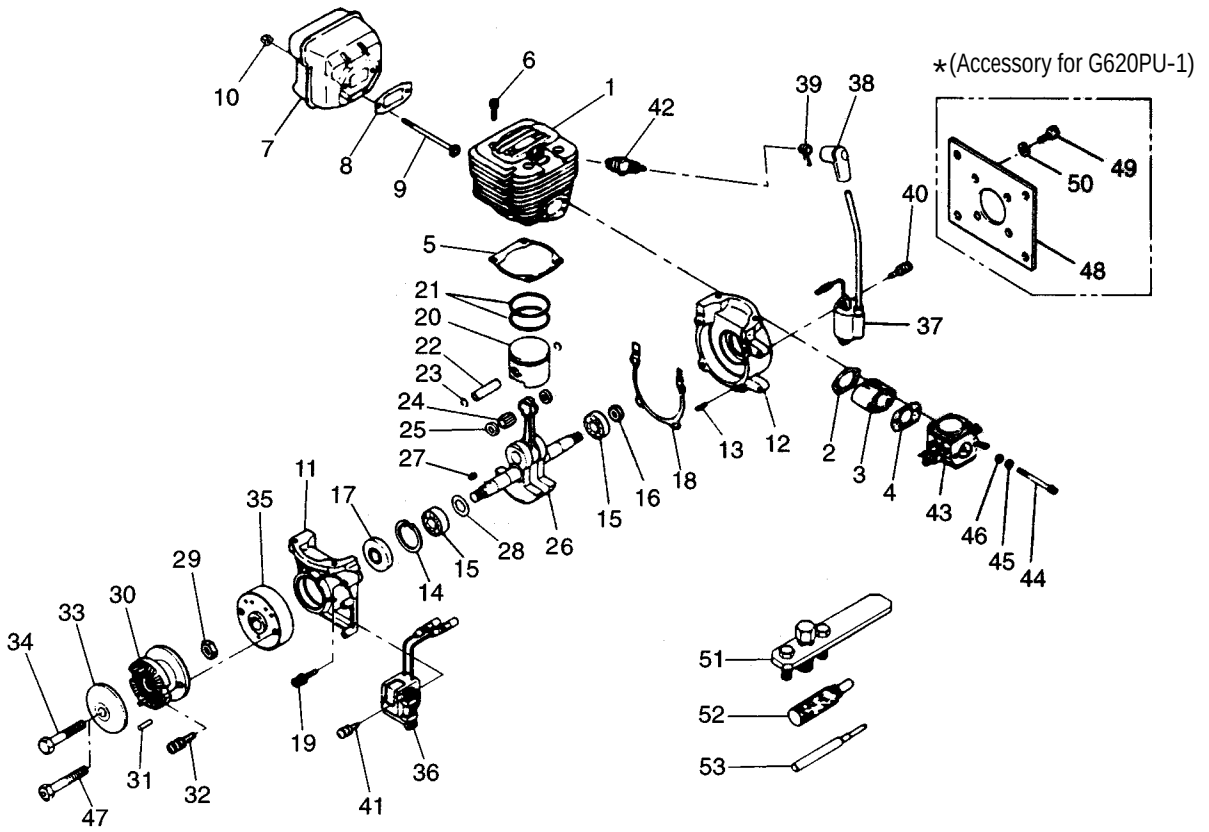

Index No.	Parts No.	Description	Q'ty/ unit
1	ZEN6201	CYLINDER	1
2	ZEN6202	INSULATOR GASKET	1
3	ZEN6203	INSULATOR	1
4	ZEN6204	CARBURETOR GASKET	1
5	ZEN6205	CYLINDER BASE GASKET	1
6	ZEN2309	CYLINDER BOLT	4
7	ZEN6207	MUFFLER	1
8	ZEN6208	MUFFLER GASKET	1
9	ZEN6209	MUFFLER BOLT	2
10	ZEN6210	MUFFLER NUT	2
11,12	ZEN6211	CRANKCASE COMP.	1
13	ZEN6213	CASE PIN	3
14	ZEN6214	SNAP RING	1
15	ZEN6215	BEARING	2
16	ZEN6216	REAR OIL SEAL	1
17	ZEN6217	FRONT OIL SEAL	1
18	ZEN6218	CRANKCASE GASKET	1
19	ZEN6219	CASE ASS'Y BOLT	4
20	ZEN6220	PISTON	1

Index No.	Parts No.	Description	Q'ty/ unit
21	ZEN6221	PISTON RING	4
22	ZEN6222	PISTON PIN	1
23	ZEN6223	PIN RETAINER	1
24	ZEN6224	NEEDLE BEARING	2
25	ZEN6225	CONROD SPACER	1
26	ZEN6226	CRANKSHAFT COMP.	2
27	ZEN6227	KEY	1
28	ZEN6228	SHIM	2
29	ZEN6229	FLYWHEEL NUT	1
30	ZEN6230	PROPELLER COMP. FOR G620PU-1 HUB	0-2
31	ZEN44553	PIN FOR G620PU-1	1
32	ZEN6232	HUB BOLT	1
33	ZEN6233	PROP WASHER	2
34	ZEN6234	PROP BOLT	1
35	ZEN6235	ROTOR	1
36	ZEN6236	SOURCE COIL	1
37	ZEN6237	IGNITION COIL	1
38	ZEN6238	PLUG CAP (BLACK)	1
39	ZEN6239	PLUG CAP SPRING	1

Index No.	Parts No.	Description	Q'ty/ unit
40	ZEN6240	IGNITION COIL SCREW	2
41	ZEN6241	SOURCE COIL SCREW	2
42	ZEN6242	SPARK PLUG, C859	1
43	ZEN6243	CARBURETOR ASS'Y	1
44	ZEN6244	CARB MOUNT SCREW	2
45	ZEN6245	CARB WASHER	2
46	ZEN6246	WASHER	2
47	ZEN6247	TAP PROP BOLT	1
48	ZEN6248	MOUNT	1
49	ZEN6249	BOLT * for G62PU	4
50	ZEN6250	WASHER	4
51	ZEN6251	PULLER ASS'Y	1
52	ZEN6252	STOPPER (OPTIONAL)	1
53	ZEN6253	PISTON PIN GUIDE (OPTIONAL)	1
	ZEN6200	SPRING STARTER	1
	ZEN6255	HI-SPEED NEEDLE	1
	ZEN6256	LO-SPEED NEEDLE	1
	ZEN6257	MAGNETO ASS'Y	1

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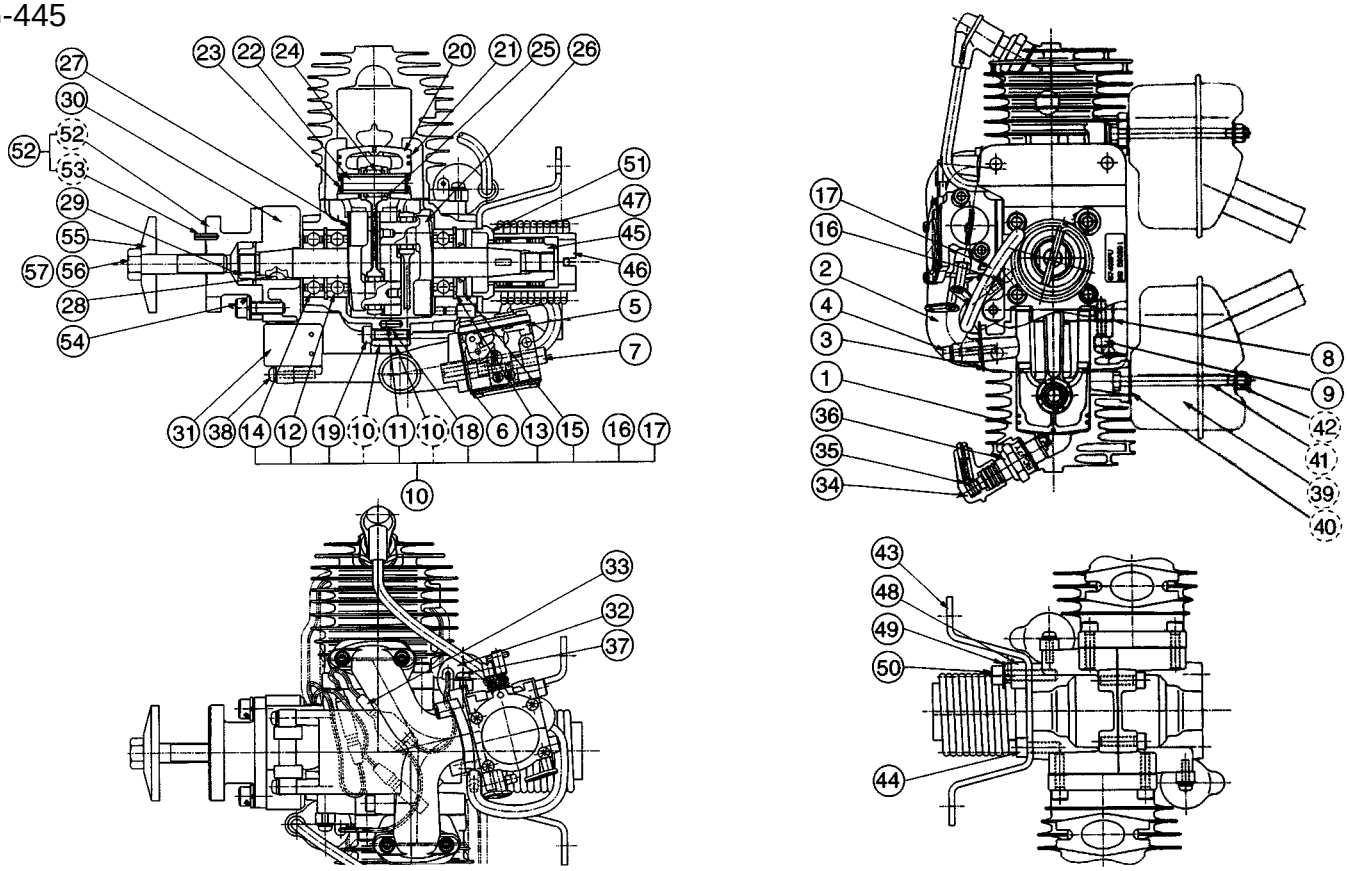

Index No.	Parts No.	Description	Q'ty/ unit
1	ZEN44501	CYLINDER	2
2	ZEN44502	MANIFOLD	1
3	ZEN44503	MANIFOLD GASKET	2
4	ZEN44504	MANIFOLD BOLT	4
5	ZEN44505	CARBURETOR ASS'Y	1
6	ZEN44506	CARBURETOR GASKET	1
7	ZEN4547	CARB BOLT	2
8	ZEN44508	CYLINDER GASKET	2
9	ZEN44509	BOLT	8
10	ZEN44510	CRANKCASE ASS'Y	1
11	ZEN6213	PIN	4
12	ZEN6215	BEARING	2
13	ZEN6214	SNAP RING	2
14	ZEN44514	BEARING	1
15	ZEN6217	FRONT OIL SEAL	1
16	ZEN6276	FUEL NIPPLE ELBOW	1
17	ZEN44517	PIPE	1
18	ZEN44518	CRANKCASE GASKET	1
19	ZEN44509	BOLT	4
20	ZEN44520	PISTON	2
21	ZEN44521	PISTON RING	4

Index No.	Parts No.	Description	Q'ty/ unit
22	ZEN44522	PISTON PIN	2
23	ZEN44523	PIN RETAINER	4
24	ZEN44524	BEARING	2
25	ZEN44525	THRUST WASHER	4
26	ZEN44526	CRANKSHAFT COMP	1
27	ZEN6228	SHIM	0-2
28	ZEN6227	KEY	1
29	ZEN6229	NUT	1
30	ZEN6235	ROTOR	1
31	ZEN6236	SOURCE COIL	1
32	ZEN6238	IGNITION COIL	2
33	ZEN44533	CORD	1
34	ZEN6238	PLUG CAP (BLACK)	2
35	ZEN6239	CAP SPRING	2
36	ZEN6242	SPARK PLUG, C859	2
37	ZEN44537	SCREW	4
38	ZEN44538	SCREW	2
39	ZEN44539	MUFFLER	2
40	ZEN44540	MUFFLER GASLET	2
41	ZEN6209	MUFFLER BOLT	4
42	ZEN44542	NUT	

Index No.	Parts No.	Description	Q'ty/ unit
43	ZEN44543	MOUNT	1
44	ZEN44544	BOLT	3
45	ZEN44545	BOSS	1
46	ZEN44546	CLUTCH COMP	1
47	ZEN44547	SPRING	1
48	ZEN44548	COLLAR	1
49	ZEN44549	WASHER	1
50	ZEN44550	BOLT	1
51	ZEN44551	PAD	1
52	ZEN44552	HUB. PROPELLER COMP	1
53	ZEN44553	PIN	2
54	ZEN6232	HUB BOLT	2
55	ZEN6233	HUB WASHER	1
56	ZEN6234	PROP BOLT	1
57	ZEN6247	TAP PROP BOLT	1
58	ZEN44555	SOCKET	1
59	ZEN6251	PULLER ASS'Y (OPTIONAL)	1
60	ZEN44554	STOPPER (OPTIONAL)	1
	ZEN44556	HI-SPEED NEEDLE	1
	ZEN44557	LOW-SPEED NEEDLE	1

POLICY

Zenoah engines are guaranteed against workmanship and manufacturing defects for a period of 3 years from the original date of purchase. This warranty is limited to the original purchaser of the engine and is not transferable.

Warranty repairs will NOT cover:

1. Normal engine wear
2. Damage due to insufficient maintenance
3. Damage related to over-revving of the engine due to small prop size or unreasonable use
4. Rusted bearings
5. Crash damage
6. Damage due to use of improper fuel and/or spark (glow) plug
7. Damage due to lean runs, such as rusted bearings, seized connecting rod or piston, etc.
8. Damage caused by foreign objects (dirt or broken glow plug filaments)
9. Damage caused by unreasonable mounting or running conditions (dust, insufficient cooling, improper mounting, improper propeller size of lack of balancing, etc.)
10. Damage due to improper disassembly
11. Modifications of any kind

If your engine needs repair, please do the following:

Ship your engine in its original box, freight prepaid to:

Horizon Service Center
Attn: Zenoah Service
4105 Fieldstone Road
Champaign, IL 61822
Phone: (217) 355-9511

Note: Do not use the engine's original box as the shipping box. Rather, package this box inside a sturdy shipping box.

1. Include complete name and address information inside the carton, as well as clearly writing it on the outer label/return address area.
2. Include a note containing a brief summary of the difficulty and include the following information:
   - Nitro content and brand of fuel (glow engine only)
   - Propeller size and brand used
   - Type of spark (glow) plug used
   - Type of engine mount
   - Approximately how much running time the engine had before difficulty
3. Date your correspondence and be sure your name and address appear on this enclosure.
4. Include a phone number where you can be reached during the business day.

WARRANTY REPAIRS

To receive warranty service you must include your original dated sales receipt to verify your proof-of-purchase date. Providing that warranty conditions have been met, your engine will be repaired without charge.

NON-WARRANTY REPAIRS

Should your repair cost exceed 50% of the retail purchase cost, you will be provided with an estimate advising you of your options. Any return freight for non-warranty repairs will be billed to the consumer.

We accept both Visa and MasterCard for payment. Please include your card number and expiration date.

The Consumer Warranty Registration below must be completely filled out and mailed to:

Horizon Service Center
Attn: Zenoah Warranty
4105 Fieldstone Road
Champaign, IL 61822

CONSUMER WARRANTY REGISTRATION

Fill in and mail this form along with your dated sales receipt (send a copy, keep the original for your files) within 10 days of purchase to:

Horizon Service Center
Attn: Zenoah Warranty Dept.
4105 Fieldstone Road
Champaign, IL 61822

Engine Type: _____

Date of Purchase: _____

Owner's Name: _____

Street Address: _____

City/State/Zip: _____

Daytime Phone Number: _____

Purchased From: _____

Dealer's Name: _____

Street Address: _____

City/State/Zip: _____

Please cut on dotted line.