HobbyKing Pulse Jet

Instruction Manual
Warning

Read the ENTIRE instruction manual and become familiar with the features of this product before operating. Failure to operate the product correctly can result in damage to the product, personal property and cause serious injury.

This Pulse Jet is NOT a toy and it must be operated with caution. This product must be operated by a responsible adult above 21 years of age with advanced RC experience. The fuel used with the Pulse Jet is Petrol/Gasoline and this fuel is extremely flammable and should be used with extreme caution. Seek assistance from an experienced modeler if you are not confident with operating this Pulse Jet.

Additional Safety Precautions and Warnings

The Pulse Jet is powered by fuel and operates with continuous explosions in the explosion chamber. It is advisable to always keep a safe distance in all directions around your Pulse Jet to avoid accidental injury.

- Always have a fire extinguisher suitable for use with Gasoline/Petrol at close hand when using the Pulse Jet.
- Never touch the Pulse Jet while it is running or before it has cooled down.
- Never stand behind or look into the exhaust nozzle while starting or running the Pulse Jet.
- Never mount the fuel tank or fuel line higher than the center line of the fuel inlet nozzle.
- Never mount the combustion tube closer than 50mm to any uninsulated wood or combustible surface.
- Never "bench run" the Pulse Jet for more than 10 seconds—it requires a cooling airflow or the Pulse Jet will overheat and damage will result. Always set the model in motion as soon as the engine starts.
- Never use fuel other than Gasoline/Petrol. Extreme care should be taken with this fuel as it is extremely flammable.
- Never leave inflammable substances near the Pulse Jet while it's running.
- Always use protective eye wear and insulated shoes.

As the user of this product, you are solely responsible for damages to the product, property or others.
The Pulse Jet operates on the pulse or resonant jet cycle, similar to that of the German V1 “Flying Bomb”. It operates in a different fashion from IC or turbine engines. Before you begin please understand the function of the main Pulse Jet components.

**Valve Head** The red colored and finned aluminium component at the front of the engine. It contains ten valve ports and serves as the mount for the Fuel Flow Regulator, Valve & Valve Retainer.

**Combustion Tube** The welded stainless steel tube which forms the body of the engine. The larger diameter forward section serves as a combustion chamber and the longer smaller diameter as the tail pipe.

**Fuel Flow Regulator** The brass assembly screwed into the venturi air intake on the Valve Head. It acts as a combined carburetor and starting device. Fuel for starting and operating the engine enters through the brass regulator. The air pressure for starting is introduced through the Blow Pipe which is attached as a strut at an angle to the main Fuel Flow Regulator stem. The Blow Pipe has a thread for attaching a compressor or tire pump.

**Caution.** Handle the Fuel Flow Regulator with care. Never exert pressure against the Blow Pipe which might cause misalignment. If the Blow Pipe is bent or wrapped out of position by mishandling, the Pulse Jet will not start. To install or remove the Fuel Flow Regulator use a pair of pilers on the central regulator stem. Do not attempt to tighten or loosen the Fuel Flow Regulator by exerting pressure...
against the Blow Pipe. Misalignment will result.

Valve The thin spring steel part with ten petals, one covering each valve port.

Valve Retainers The aluminium disc which clamps the Valve against the Valve Head.

Pulse Jet Starting

When air under pressure is supplied through the Blow-Pipe of the Fuel Flow Regulator, a metered charge of Gasoline is drawn from the fuel tank through the metering gauge. This metered charge is mixed with air as it passes through the intake venuri and Valve Ports to the valve. The resulting combustible mixture of fuel and air under pressure then opens the valve and passes into the combustion chamber. The spark plug will ignite the mixture of air & fuel which sets up an explosion within the combustion chamber. The pressure resulting from the combustion closes the valve and sets up a pressure wave in the tail pipe of the engine.

Pulse Jet Running

Once the initial charge has been inducted and continuous firing occurs, the Pulse Jet will run automatically. No forced air supply or additional spark ignition is required.

The pressure wave set up in the exhaust pipe by the firing of the initial charge runs in a cyclical nature. It first becomes a negative pressure, drawing another metered charge of Gasoline and air though the valve and into the combustion chamber. It next becomes a positive pressure, closing the valve and firing the new charge with the aid of hot gas remaining from the previous combustion. The process is repeated automatically at the rate of 220~240 cycle/second as long as the fuel & air are supplied.

Do not try to increase the power of the engine by altering Valve Ports, Venturi, Tail Pipe, or any other parts, since you will upset the balance and either impair the operation of the engine or render it completely inoperative.
Auxiliary equipment required

To start the Pulse Jet, an air supply and ignition system are required.

Air Supply

The air source may be a workshop air compressor unit or a solid bicycle pump. The correct application of compressed air is 'skill' acquired by practice with the Pulse Jet and you will soon learn to feed the correct amount. The minimum required pressure is around 40 psi.

The thread on the Blow Pipe is an external Schrader 0.305"OD 32TPI (Threads per Inch).

Ignition system

The START ignition sequence for the Pulse Jet is as follows:

1) Wear protective gear such as electrical gloves and insulated shoes.
2) Ensure the battery is disconnected and the ignition switch is in the OFF position.
3) Connect the RED alligator clips (position +ve) to the spark plug.
4) Connect the BLACK alligator clips (negative -ve) to the stainless mount ring. Always make sure that the circuit is grounded before turning on the 'On' ignition switch.
5) Connect the battery to the ignition system.
6) Load fuel and then supply air to the intake of the Pulse Jet
7) Turn ON the ignition switch.

Fuel and air will then mix and the spark plug will ignite the chain reaction of the Pulse Jet.

Once the Pulse Jet is started

8). Turn OFF the switch of the ignition system.
9). Remove both RED alligator clip from the Spark plug and the & BLACK alligator clip from the mounting ring.
10). Disconnect the battery from the ignition system.
Fuel System

Caution

Petrol is extremely flammable and should be used with extreme caution. Never allow it to be stored in an open source or around an ignition source. Never allow petrol to contaminate your skin or wet your clothes. Never allow spilt petrol to be in and around the Pulse Jet.

Fuel

The fuel, piping and fuel tank location is of prime importance for satisfactory operation of the Pulse Jet.

Plain Unleaded or High Grade Octane automobile petrol should be used. No other fuels should ever be used.

Fuel Tank

Use a metal model fuel tank or plastic tank specifically designed for use with Petrol/Gasoline. The fuel tank capacity should be around 500 cc. The Pulse Jet consumes at least three times the amount of fuel compared with a RC Nitro engine. Use a fuel tube that is specifically designed for use with Petrol/Gasoline. Due to the many varieties of Gasoline blends that are available, not all silicone tubing will handle Petrol. Purchase a 1/8" (3 mm) Silicon or Neoprene fuel tube that is specifically rated for Petrol.

Fuel Level

Caution - never mount the fuel tank or fuel line higher than the center line of the fuel inlet nozzle. If the fuel level is above the fuel inlet nozzles, gravity will force the fuel through the spray orifices and may result in the hazardous operation of the Pulse Jet.

Hard starting of the Pulse Jet may result if the fuel level is more than 25 mm (1") below the centre line of the brass metering jet inlet nozzle.

The top of the fuel tank should always be located below the centerline of the metering jet. The preferred location is 10 - 20 mm below the center line of the metering jet for easy starting. The tank may be mounted lower than this, if desired, and the correct starting suction fuel lift of 10 - 20 mm be obtained by means of tilting the model. When the fuel tank is located ahead of the metering jet, tilting the nose of the model up richens the mixture. Tilting the model is employed as a starting mixture adjustment instead of a needle valve adjustment.

Once the engine is started the height of suction lift is unimportant except that minor loss of power results if the lift is too great. Suction lifts in excess of 75mm are not recommended. The tank is best mounted ahead of the power tube for protection from heat.
Fuel Tank Mounting

The fuel tank may either be mounted as part of the vehicles, forward of the combustion tube for protection from heat. Always make sure the top of the fuel tank is below the center line of the metering jet.
Test Running of the Pulse Jet

1) Three stainless steel mount straps have been supplied for mounting the Pulse Jet. Heat and rigidity must be considered in choosing the mounting points. From approximately 25 mm back of the valve to within 25 mm of the exhaust nozzle the combustion tube is subject to extreme heat. These straps should be wrapped tightly and secured with the M5 machine screw & nut sets. Secure the strap bases to a solid surface with the provided self-tapping screws. Three mounting points are recommended for rigidity. These may be two straps around the tail tube, front & rear and one around the larger diameter combustion tube. The 60 mm stainless steel mounting ring may be formed around the combustion tube and tightened in place with a small through bolt. The projecting ends of the straps may be turned to add stiffness. The 'L' shaped stainless steel straps are used as mounting points.

Never operate the Pulse Jet excessively without air cooling because damage will result.

Never try to hold the Pulse Jet in your hand while it is running; severe burns will result from the intense heat generated.

2) Connect the fuel tank to the brass metering fuel gauge with a fuel pipe avoiding kinks & sharp bends. Fill the tank to the top with Gasoline as recommended under the paragraph 'Fuel System'. Make sure the fuel level is 10 mm below the center line of the brass metering fuel gauge to ensure easy starting.

3) Screw the air hose of the air source on to the Blow Pipe.

4) Connect the ignition system to the spark plug, and clip the ground lead of the system to a convenient point on Pulse Jet, as recommended under the paragraph 'Ignition System'.

Starting

1) Turn “On” the ignition system.

2) If an air compressor is used, simply supply the air into the Blow Pipe tube on the fuel nozzle under pressure intermittently until the Pulse Jet starts. The Pulse Jet should “pop” intermittently. When it has “popped” a few times, the mechanism will become warm enough to sustain the operation.

3) If there is a difficulty encountered during starting, choke the engine by obstructing the venturi air intake while the compressed air is being supplied. The engine will not start when it is choked, but this process will provide a rich fuel/air mixture as a preliminary to starting.
Running

When the Pulse Jet starts the supply of air should be stopped. The air hose should be unscrewed from the Fuel Flow Regulator and the ignition system should be turned off and disconnected. **Always turn the ignition system “OFF” before disconnecting the wire leads to Pulse Jet.**

Stopping the Pulse Jet

In order to stop the Pulse Jet, just pinch the fuel pipe to stop the flow of fuel or obstruct the venturi air inlet, cutting off the air flow.

Heat

When running, the Pulse Jet generates intense heat and the combustion tube will becomes red hot in a few seconds. This is normal because there is no flow of air to cool the engine. Running the Pulse jet standing still without any cooling air flow will damage the unit. In motion, the Pulse Jet is cooled by the air movement caused by the forward movement of the vehicle.

The Pulse Jet:

- should not be statically run for more than 10 seconds at a time
- the operation of the Pulse Jet in a vehicle with air movement should not exceed two minutes.
- after running, let the Pulse Jet cool down naturally to room temperature. Never cool the Pulse Jet with any other means when it is still in a red hot condition. It will damage the unit.
Starting hints - the Pulse Jet should be warm in order to start readily. If the engine is cold or the surrounding temperature is low, choking may be employed. Partially obstruct the air intake venturi while feeding the compressed air until the Pulse Jet "pops" enough to warm itself up.

The correct application of compressed air is 'skill' acquired by practice with the Pulse Jet and you will soon learn to feed the correct amount.

Backfiring - if the Pulse Jet backfires through the air intake it is likely that the valve is damaged. Remove the valve head and check to see that the valve covers all ten port holes. If the edges of the valve are damaged the valve should be replaced to prevent any damage to the valve seat.

Shoots yellow flame - if the Pulse Jet shoots a yellow flame from the exhaust nozzle when starting, the fuel level is too high or the fuel gauge has become misaligned through mishandling. Try lowering the fuel level.

Failure to start - check the fuel system, making sure dirt has not lodged in the brass metering jet or obstructions between the metering fuel gauge and fuel supply. Make sure the fuel tank is full. Check the ignition system to make certain that a hot spark is occurring. This may be checked by removing the valve head and observing the spark plug points with the power on.

If there are any air leaks in the combustion tube assembly, the Pulse Jet will not run.

If the exhaust nozzle is dented or out of shape, the Pulse Jet will not develop full power.

Engine shut down - the Pulse Jet is equipped with a 0.9mm fuel gauge which provides the best operation under normal conditions. In some cases the engine can shut down due to bouncing or centrifugal force in the vehicle it is mounted to because fuel is not being delivered correctly. Always start the flight with a full fuel tank. Rough take-offs can mean the fuel moves around a lot in the tank. For control line models the fuel outlet line should open into the side of the fuel tank nearest the outside of the control line circle, not into the bottom of the tank. The air inlet and filler tubes should open onto the front forward motion side of the tank because this forces air pressure into the tank.
Application to Vehicles

Mounting

Heat and rigidity must be considered in choosing the mounting points. From approximately 25 mm back of the valve to within 25 mm of the exhaust nozzle the combustion tube is subject to extreme heat.

Three mounting points are recommended for rigidity. These may be two straps around the tall tube, front & rear and one around the larger diameter combustion tube.

Three stainless steel mounting straps have been supplied for mounting the Pulse Jet. These straps should be wrapped tightly and secured with the M5 machine screws & nuts. Secure the strap bases to a solid surface with the provided self-tapping screws. The 60 mm stainless steel mount ring may be formed around the combustion tube and tightened in place with a small through bolt. The projecting ends of the straps may be turned to add stiffness. The 'L' shaped stainless steel straps are used as mounting points.

Caution

Never mount the combustion tube closer than 50mm to any insulated wood surface. Do not use aircraft dope or other inflammable paint in the vicinity of the combustion tube. Always use heat resistant matting or compounds found at hardware stores on all surfaces within close proximity to the combustion tube.

RC Specific Application

Caution. The Pulse Jet is not recommend for any man carrying application such as gliders, bicycles, cars, canoes or scooters.

Radio Control & Control-line model aircraft

Most aeronautical associations ban the use of Pulse Jets in Radio Controlled aircraft because of safety concerns. If the model crashes there is a very good chance a fire will result which would spread easily to the surrounding environment. Petrol (Gasoline) is extremely flammable and in a crash the combination of a Pulse Jet’s hot exhaust pipe and a damaged fuel line could potentially pose a fire risk. If you are uncertain, seek the advice of your local RC model club or aeronautical association in your country.

The only type of model aircraft we recommend the Pulse Jet to be used in is a Control-line model.
Radio controlled Cars & Boats

Due to the rough riding quality of cars & boats at high speeds, the fuel system requires special attention. The tank should be larger and so shaped that centrifugal force throws the fuel toward the fuel supply line outlet. If the tank is not large enough and the fuel supply line outlet not correctly located, rough riding will cause air to enter the fuel line and cause the Pulse Jet to stop.

Replacement Parts

Occasional replacement of a worn valve or spark plug is the only servicing normally required.

Valve replacement

Unscrew the valve head. This operation should be performed by hand. Grip the tail pipe in the left hand and the valve head in the right hand. The combustion chamber should not be gripped since hand pressure may distort the female threaded ring and prevent the valve head from unscrewing. If difficulty is encountered in unscrewing by hand, pilers or a pipe wrench may be applied to the portion of the valve head projecting in front of the fins. Do not attempt to unscrew the valve head while it is warm. Heat expands the aluminium head and makes it impossible to unscrew until cool.

Unscrew the valve retaining screw with an Allen key and remove the washer, valve retainer, and valve. Discard the damaged valve.

The valve seating surface of the valve head may be dressed to remove any abrasions made by a damaged valve. To do this, place a piece of emery cloth on a flat surface and carefully rub the valve seating surface against the cloth until all marks are dressed out. Never dress or tamper with the curved surface of the valve retainer.

In reassembling, make sure the new valve is correctly indexed so that it covers the valve ports evenly. A locating hole will be noticed in the valve seating surfaces. The valves should be indexed so that this holes falls exactly between two petals. Place the "cupped" washer so the outer diameter bears against the valve retainer. Tension the valve retaining screw carefully so as not to damage the threads in the valve head. Make sure it is tight enough. The valve damage will result if the screw loosens in operation.

In replacing the valve head, screw it three full turns into the combustion tube before locking in place with the lock ring.

Spark Plug Replacement

The spark plug will require replacement only if it is mishandled. Any pressure on the spark plug porcelain or center electrode will cause damage once the engine is running. Loosening of the center electrode or a breaking of the porcelain will result.
Care must be exercised in removing and replacing damaged spark plugs, or the combustion tube will be damaged. Allow penetrating oil to soak into the spark plug threads from both inside & outside the combustion tube before removing the spark plug. Then use two wrenches, one on the spark plug and one on the spark plug nut inside the combustion tub. Proceed very carefully lest the thin wall of the combustion tube be damaged.

*With a pair of hand pliers, cut the side electrode of the new spark plug shorter by 2.8 mm. This allows a bigger gap for the spark to jump across and mix with fuel and facilitates easier starting.*

Do not use washers or gaskets on the spark plug. Tension carefully, using two wrenches again, making sure the sparkplug and nut are extremely tight.
Ignition System
Warning

Read the ENTIRE instruction manual and become familiar with the features of this product before operating. Failure to operate the product correctly can result in damage to the product, personal property and cause serious injury.

This Ignition System is NOT a toy and it must be operated with caution. Seek assistance from an experienced modeler if you are not confident with operating this Ignition System. This product is not designed for use by children.

As the user of this product, you are solely responsible for damages to the product, property or others.

The Ignition system is powered by 2s~3s LiPo Battery (7.4V~11.1V). It is advisable to always wear protective equipment such as electrical gloves & insulated shoes when operating this ignition system.

Specifications
Dimension: 132 x 125 x 115 mm
Operating temperature: −20 Degree Celsius ~ 60 Degree Celsius
Humidity: <95%
Power Input: 2S ~ 3S Battery
Power Output: >10KV
Current:100~150mA

Caution - High Voltage output. Always make sure that the circuit is grounded before turning on the 'On' ignition switch.
This Ignition System is designed for use with the HobbyKing Pulse Jet.

The **START** ignition sequence for the Pulse Jet is as follows:

1) Wear protective gear such as electrical gloves and insulated shoes.
2) Ensure the battery is *disconnected* and the ignition switch is in the **OFF** position.
3) Connect the **RED** alligator clips (position +ve) to the spark plug.
4) Connect the **BLACK** alligator clips (negative -ve) to the stainless mount ring. *Always make sure that the circuit is grounded before turning on the ‘On’ ignition switch.*
5) Connect the battery to the ignition system.
6) Load fuel and then supply air to the intake of the Pulse Jet
7) Turn **ON** the ignition switch.

Fuel and air will then mix and the spark plug will ignite the chain reaction of the Pulse Jet.

Once the Pulse Jet is started

8) Turn **OFF** the switch of the ignition system.
9) Remove both **RED** alligator clip from the Spark plug and the **& BLACK** alligator clip from the mounting ring.