

# Instructions for FA-450R3-D AAC 4 Stroke Cycle Engine

This is the biggest 4 cycle engine ever built for R/C model Airplane in the market and congratulate you on your selection of this Saito FA450R3D engine.

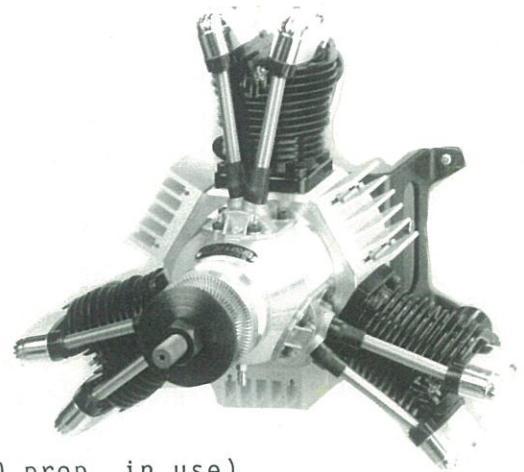
Saito Company ask you to read the instructions carefully and treat this engine with loving care.

If in case, should you have the need for engine rectification based on manufacturing defective, we guarantee to repair your engine. This FA450R3D engine is assembled utilizing special jigs and tools. Thus you shouldn't disassemble the engine, however if it becomes necessary to dismantle the engine for such as crush, please forward your engine to Saito Service Center.

Unnecessary engine dismantle may result in the voiding of your warranty. At present, big models more than 1/4 scale Airplanes are very popular and attractive of its dynamic flying pattern however there was no suitable bigger 4 cycle engine in the market. Thus flyers had to use alternate 2 cycle engine. This is the engine to satisfy flyers have been longing for those big model A/C that is SAITO FA450R3D radial 3 cylinder 4 cycle engine. Our recommendation for this engine is wing capacity of approx. 100 dm<sup>2</sup>.

## FA450R3D Engine Specifications

Bore;	34mm dia.x3cylinder
Stroke;	27.6mm x3
Capacity;	75 cc
Weight;	approx. 2,900 g
Firing order;	1-3-2
Outer diameter;	250mm dia.
Practical RPM;	1,800 - 8,000 rpm
Propeller;	22 x 10 to 24 x 10
Static thrust;	approx. 20 kg (22x10 prop. in use)
Fuel consumpt;	60cc per a min.(15% nitro, prop.22x10 full throttle)
note, figures will vary, bigger load consumes more fuel and smaller load will less consumption.	



## FA450R3D engine Characteristics

The engine is suitable for big model. Low vibration(due to evenly firing). Easy starting(with normal direction turn). Engine sound is like genuine. Idling stability available without plug heating obtained by special port type intake manifold that equalize mixture to individual cylinders.

Heat-sink ; Additional cooling to crankcase housing.

Lubrication; Cam lube is forced by specified adaptor.

Dual plug; Cylinder aft plugs are heated when starting.  
Fwd plugs will be heated by self when engine started.  
Dual plug system is effective for engine idling and also more efficient burning is obtained as well.

Cam; Introduced high cam design to get longer maximum valve lifting time.

Prop.lock device; designed to positive lock for safety feature (also handy to install prop. spinner).



#### A. Fuel

It is very important for engine to use high quality fuel containing 10~20% nitro. For consistent performance and long engine life, use fuel containing **AT LEAST 20%** lubricant by volume. **(DO NOT USE LOW OIL FUEL)** Since the 4-cycle engine has high exhaust temperature and carbon is apt to accumulate when castor oil type lubricants are used. The fuel filter is to be installed and SAITO F-1 is designed for this model engines. **SAITO fuel filter "F-1" exhibits highest performance.**

#### B. Fuel tank

We recommend a tank with a capacity of 1,000cc .(Bigger model need big tank to avoid tank empty condition during flight that will cause airplane to crash.) Mount the fuel tank approx. 5mm lower than carburetor center.

#### C. Plug.

The selection of glow plugs is most important as the engine fires only once per cylinder for every 2 complete rotations. We recommend SAITO P-4 plugs and unsuitable plug will cause the engine malfunctioning. The glow plug is replaced so often as required.

#### D. Propeller

Use of SAITO "SAI GP01" (SS) Glow Plug is recommended.

The standard range is 22x10 to 24x10 depend on your model. Use a strong, high grade fiberglass or carbon series propeller and make certain it is well balanced. Un balanced propeller may cause vibration and deteriorate performance and it is danger. Do not run the engine higher than 8,000 rpm with smaller propeller and choose the propeller that turn 7,000 to 8,000 rpm on the ground running. Beware of propeller rpm differ with same sizes and same size of same manufacture.

#### F.Engine Starting Procedure

The following procedures should be followed to start your engine. (Muffler pressure must be used). Your should mount the engine on the horizontally leveled test bench or fixing tight on the Airplane. Fuel tank needs to be bigger than 1,000 cc and approx. 22x10 fiber-glass or carbon series propeller is recommended. If you see visitors at running sight, keep them away backward prior starting.

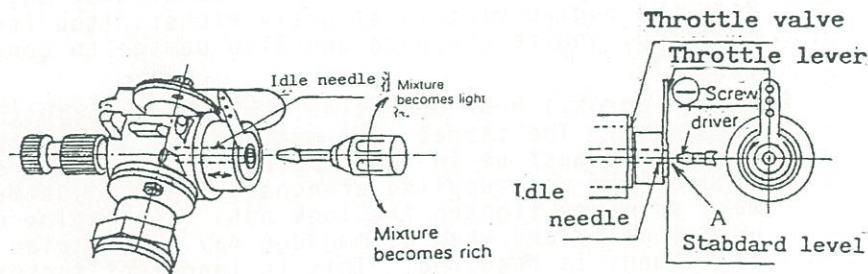
1. Fully open the throttle valve.
2. Open needle valve approx. 3 1/2 turns (after engine started, needle valve should open if mixture is lean, and close if mixture is rich. Also open needle valve for gigger prop. and close for smaller prop.)
3. Close choke valve.
4. Turn the prop. one or 2 turns clockwise direction to suck in the fuel. (priming is satisfactory if fuel start to drip from exhaust manifold).
5. Open choke valve.
6. If over choke is occurred, piston rod may damage and to confirm that you don't have a hydraulic lock, turn propeller by hand and ensure prop. rotateing free.
7. Open the throttle valve to just above the idling position. (if opened throttle farther more, airplane will move forward and an attention is required in big model).
8. Turn the propeller clockwise untill compression stroke and energize the glow plugs. (if battery is small, energize glow plugs individually by 3 batteries).
9. Swing the propeller smartly clockwise for the engine start. (There is no kick-back in the multi-engine starting however use strong glove for hand starting and we recommend you use an electric starter. For your personal safety, beware of big prop. diameter and needle adjustment is to be done from the engine backward.



### E. Carburetor Maintenance and Adjustment

SAITO engine carburetor's slow needle is pre-adjusted at the factory for best performance during break-in. However the engine may be necessary to fine tune due to engine installation, propeller size, fuel, plug, weather condition etc. please refer to the followings. (if original slow needle position is in doubt after rotating, standard position is 1/2 turns clockwise position from flush at the throttle lever face as shown arrow A-mark.)

1. Open main needle valve approx 3 1/2 turns.
2. Open the throttle valve approx. 1/4 and start the engine.
3. Open the throttle valve fully and adjust main needle for best high speed running. (Judge proper operation with exhaust sound and smoke. It is recommended to use Tachometer for accurate adjustment and beware of too lean operation.)
- Close the throttle valve slowly and adjust the idling speed.
  - a. too rich mixture.



4. Close the throttle valve slowly and adjust the idling speed.
  - a. Too rich mixture.
    - when you close the throttle valve to idle, the engine will stop.
    - when you open the throttle rapidly and the engine emits white smokes and stutters.Situation above are corrected by turning slow needle clockwise direction and make lean mixture.
  - b. Too lean mixture.
    - when you close the throttle valve to slow rpm, the engine will stop.
    - when you open the throttle valve rapidly and the engine emits no smoke with stutter sound.Situation above are corrected by turning slow needle counter-clockwise direction and make rich mixture.
5. With above adjustments, you now will have best response at all settings.
6. After obtaining the proper idling, the throttle valve setting may be made through the servo movement.

### G. Break-in.

The correct break-in for your engine can be assured of long lasting and maximum performance. After the engine started, open the throttle valve to about 1/2, and needle valve set rich to give approx. 3,000 to 4,000 RPM (recommend you to use Tachometer) for 20 min. run engine. If required, glow plugs are remain energized. (This break-in is ensured all moveable parts like connecting rod, gears etc. to make smooth operation). After this, adjust needle valve 80% out of peak RPM and run the engine one tank of fuel. Lastly, adjust needle valve to set peak RPM and then set rich until the engine is running smooth then the engine may now be mounted in the Airplane. The break-in will complete by the first 5 flights flying with mixture set slightly rich.



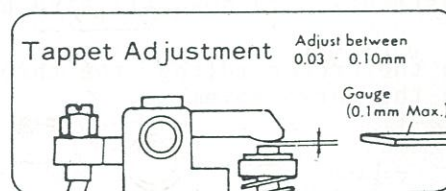
The break-in may be accomplished with the engine mounted on the airplane, and flying higher altitude with throttle valve set at about mid position.

Carburetor adjustment after break-in.

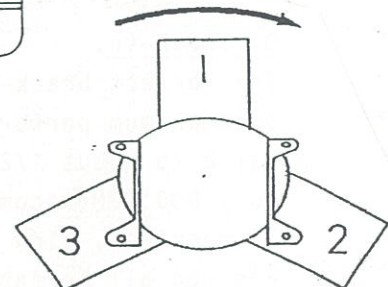
1. Fully open the throttle valve.
2. Obtain peak RPM with adjusting main needle, then turn needle 2 to 3 clicks counter-clockwise direction.
3. Close throttle valve to obtain idling speed and adjust slow needle to set approx. 1,700 to 1,800 rpm running
4. Lastly, fine adjustment is required to obtain smooth response at all settings.
5. Now you may fly out of sky high but recommend you to fly higher for awhile and ensure to have enough altitude in case of engine stoppage.

#### H. Normal engine operation and Maintenance.

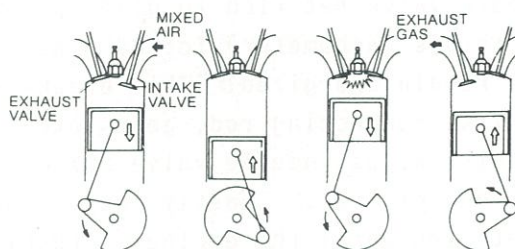
1. Do not operate the engine with a leaner that may cause overheating. Keep the engine mixture slightly richer. (too lean will cause knocking, engine stoppage and also damage to connecting rod, cam gears.)
2. After approx. 1 hour operation, tappet gap adjustment may be necessary. The tappet gaps must be adjusted with the engine cold and valves must be in the compression stroke as shown in the figure, and use supplied wrenches. When adjustment is completed, make sure you tighten the lock nut. The engine need to be checked occasionally and when 0.1mm gauge may be inserted between gapas, adjustment is required. This is important factor in maintaining 4 cycle engine, otherwise will lead to deteriorate your engine performance.
3. When you checking locker arm and valves, lubricate the moveable parts as required.
4. After engine running, spray lubricant to crankcase via breather nipple.
5. Apply lubricant to cylinder via glow plug hole while spinning crankshaft.
6. If spray type lubricant is not available, open the throttle fully and apply rust inhibitor lubricant and spin crankshaft 4 to 5 turns like choking procedure.
7. If the engine may have been sitting for certain period of time, close choke valve after lubed. (recommend to cover with plastic bag).



Direction of Propeller Rotation  
as Viewed from the Fire Wall Forward



#### Explanation of 4 Stroke Cycle Engine



1. Intake Stroke
2. Compression Stroke
3. Expansion Stroke
4. Exhaust Stroke

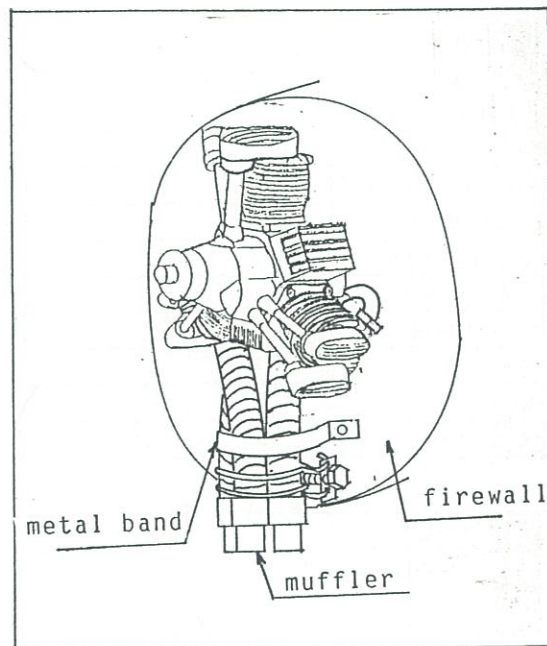
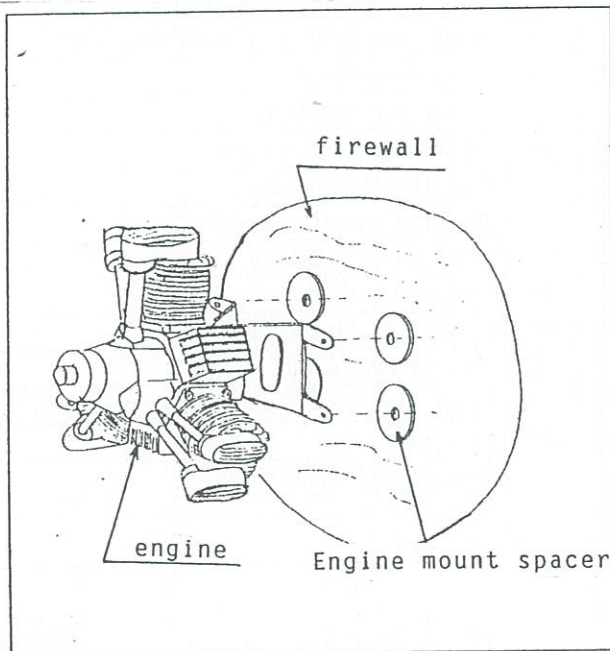
The four stroke engine consists of four individual piston movements as illustrated above. "Stroke" means that the piston is moved from the upper dead center to the lower dead center point. In the four stroke engine, one cycle is completed every two revolutions of the crankshaft.

The engine and muffler installation, glow plug heating circuit are shown as below.

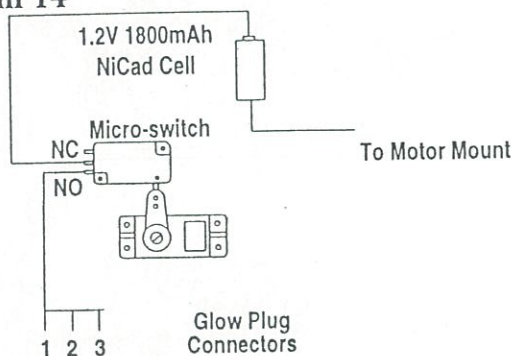
Refer as schematic, the engine mount spacers are recommended to install between mount and firewall. This will minimize firewass panel squeezing and also works as reinforcement.

(Engine mount spacers are included in the kit.)

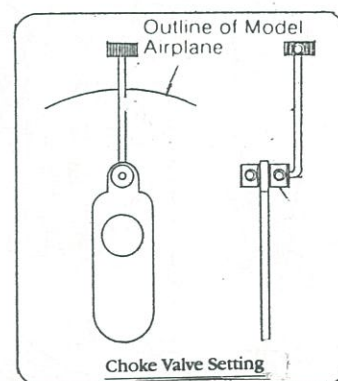
Refer to the fixing and secureing the muffler to the firewall or airplane with metal band or wire as shown in schematic below.



**Diagram 14**



NOTE: It is imperative to use 23 gauge or greater wire for the battery connections.



All specifications and models are subject to change without notice.

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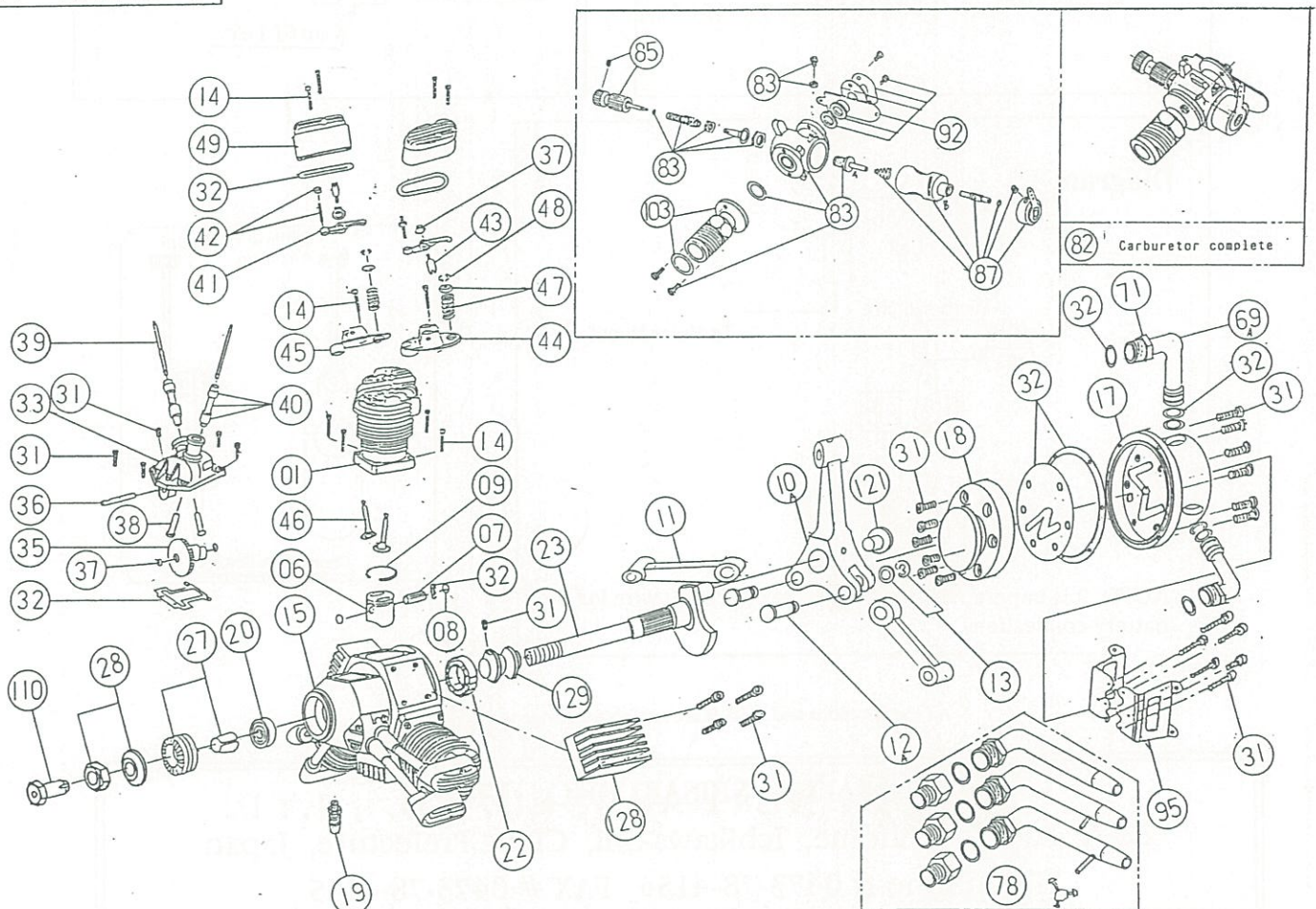


# SAITO FA-450R3-D Parts List

NO	Description	Q'ty
01	Cylinder	3
06	Piston	3
07	Piston pin	3
08	Piston pin retainar	6
09	Piston ring	3
10	Connecting rod (Master rod)	1
11	Linked conrod (Link rod)	2
12	Linked conrod pin (linkpin)	2
13	Linked conrod pin retainar (E-ring) & Washer	2ea.
14	Cylinder screw set	3set
15	Crankcase	1
17	Rear cover (A) (Intake manifold)	1
18	Rear cover (B)	1
19	Breather nipple	1
20	Front bearing	1
22	Rear bearing	1
23	Crankshaft	1
27	Taper collet & Drive flange	1ea.
28	Prop washer & Nut	1ea.
31	Crankcase screw set	1set
32	Engine gasket set	1set
33	Cam gear housing	3
35	Cam gear	3
36	Cam gear shaft	3
37	Steel Washer set	1set

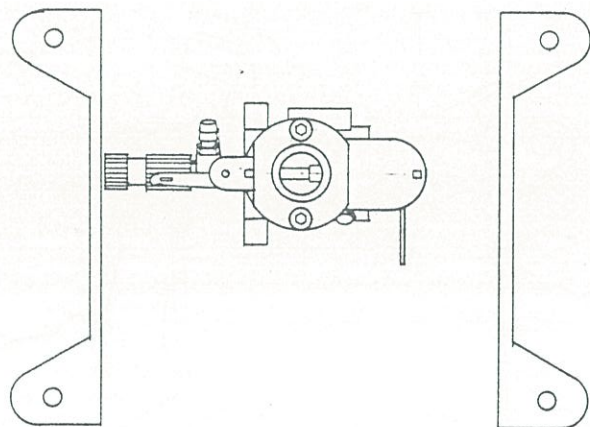
NO	Description	Q'ty
38	Tappet (Valve lifter)	6
39	Pushrod	6
40	Pushrod cover & Rubber seal	6ea.
41	Rocker arm	6
42	Rocker arm screw & Nut (Adjust screw & lock nut)	6ea.
43	Rocker arm pin	6
44	Rocker arm bracket (left)	3
45	Rocker arm bracket (right)	3
46	Valve (in & out)	6
47	Valve spring & Keeper & Retainer lock	6ea.
48	Valve spring retainer lock	12
49	Rocker arm cover	6
69	Intake manifold (Intake pipe)	3
71	Intake manifold nut (Intake pipe nut)	3
78	Muffler complete	1set
82	Carburetor complete	1set
83	Carburetor body assembly	1set
85	Full throttle needle	1
87	Throttle barrel assembly	1set
92	Choke valve assembly	1set
95	Engine mount	1set
103	Carburetor fitting flange	1
110	Anti-loosening nut	1
121	Crank pin spacer (Master rod retainar)	1
128	Heat sink	3
129	Lubricating adapter	1

## FA-450R3-D



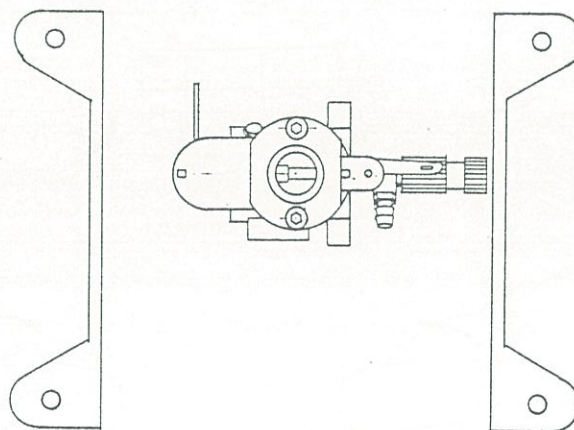


Carburetor fitting in FA-450R3-D as viewed from the rear



**Normal installation.**

Full throttle needle at left / Throttle lever at right.



**Incorrect installation.**

Never move the carburetor as shown on the above illustration, as an engine runs in bad condition.

# How to install mufflers

