KFM INC.
ORANGE COUNTY AIRPORT
R.D. 2 BOX 8
MONTGOMERY NY 12549

This is a temporary issue of the OWNER'S MANUAL and a definite booklet is under printing.

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KFM inc. - Tel.: 914-457-3188

Thank you

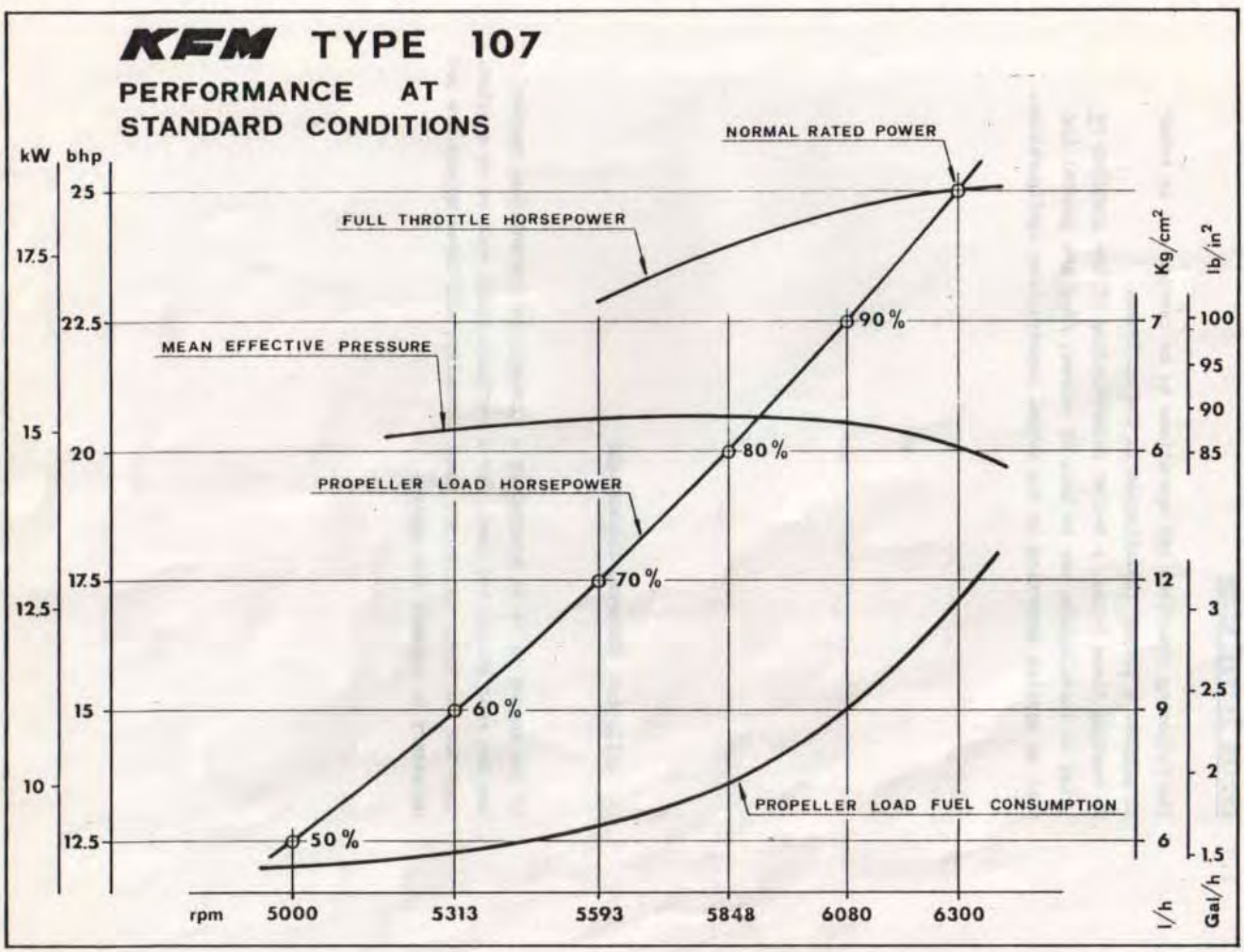

KFM TYPE 107
PERFORMANCE AT
STANDARD CONDITIONS
NORMAL RATED POWER
FULL THROTTLE HORSEPOWER
MEAN EFFECTIVE PRESSURE
PROPELLER LOAD HORSEPOWER
PROPELLER LOAD FUEL CONSUMPTION
kW
bhp
25
17.5
22.5
15
20
17.5
12.5
15
10
12.5
50 %
60 %
70 %
80 %
90 %
rpm
5000
5313
5593
5848
6080
6300
Kg/cm²
7
6
12
9
6
l/h
lb/in²
100
95
90
85
3
2.5
2
1.5
Gal/h

FIG. 1.2

SECTION 2

2.1 ENGINE INSTALLATION

The following describes the operations to be carried out in order to achieve a proper installation in the airframe.
By reading these notes, a better understanding of the problems related to installation may be had. Of course, they are general and must be applied according to the actual construction configuration.

(FIG. 2-1 External Dimensions)

If the engine is to be mounted on a firewall in conventional manner, the two rear mounts are used. For a vertical mount such as on a pylon, then the two lower mounts are used. Normally, all three mounts are not necessary to support the engine.

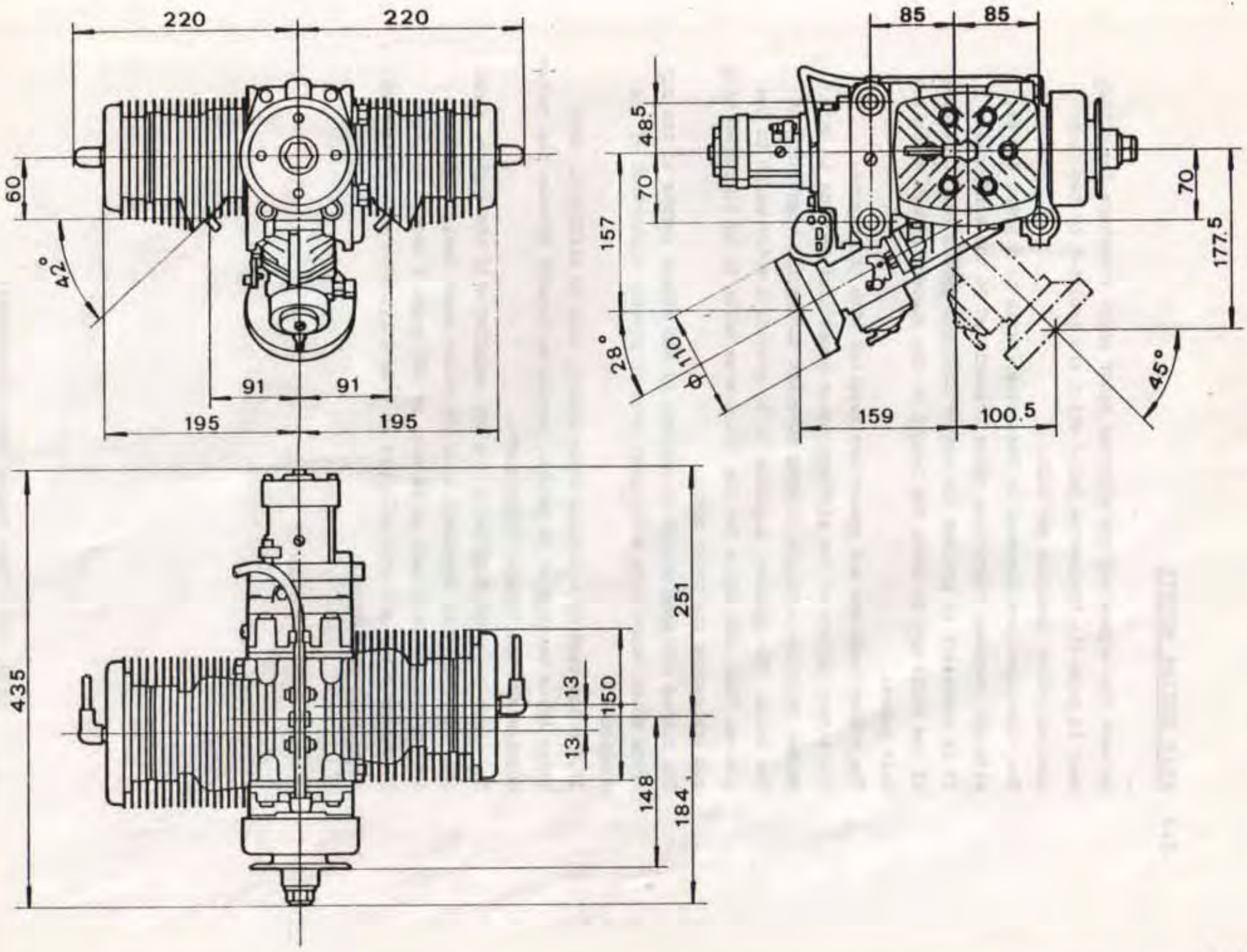

220
220
60
42°
91
91
195
195
85
85
48.5
70
157
70
177.5
28°
110
45°
159
100.5
435
251
13
150
13
148
184

FIG. 2.1

2.2 REAR ENGINE MOUNTS

Between the engine and the airframe motor mount structure the attachment is made via transverse bolts which are isolated by two control conical rubber cushions per bolt.

The vibrations are dampened by the rubber media to a great degree, with the residual vibrations being transmitted to the airframe.

It is necessary to preload the rubber cushions during the tightening of the bolts and to check the length or the spacer through which the bolt passes.

The rubber cushions and spacer are supplied with the engine.

The attach points of the airframe motor mount must be made in such a manner to allow a slight closing movement during the tightening of the bolts. The simplest solution is to provide a motor mount in two pieces. This will allow for the transverse bolts to be tightened without preloading the motor mount.

The rubber cushions should be covered by the attach points of the airframe motor mount with sufficient area to prevent distortion of the cushions.

If, in the case of a tubular motor mount, this is difficult, then large thick washers of 32 mm dia. should be located between the rubber cushion and the tubular motor mount.

The transverse mounting bolts are not supplied with the engine, since the bolt length is dependent upon the motor mount design.

A high quality bolt such as AN std. or SAE grade B should be used.

If metric sizes are available use AN 8 mm dia., otherwise a 5/16" AN stud. will be suitable.

(FIG. 2-2 - Rear Engine Mount Attachment)

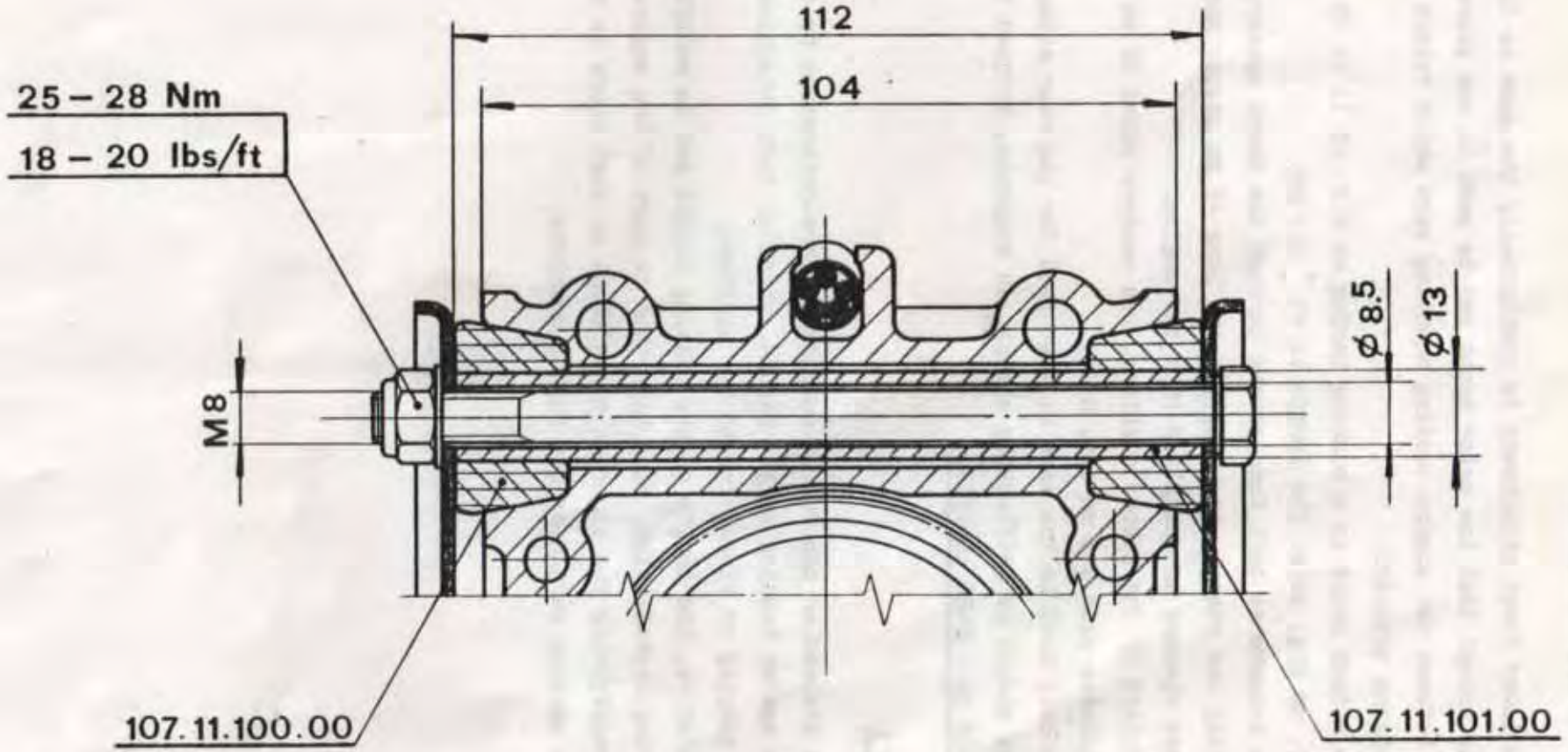


FIG. 2.2

2.3 FRONT ENGINE MOUNT

The lower front attachment is conceptually the same as those on the rear except that the motor mount may be made in one piece and inserted between the engine casting mounting ears which retain the rubber cushions outboard.

The attach point is a bushing having an O.D. of 13 to 15 mm with a 8.5. mm dia. hole. The length is 45 $\pm$ 0.1 mm.

The transverse bolt then passes through the short spacers located within the rubber cushions and the long 45 mm spacer mentioned above. These spacers are supplied with the engine.

Outboard of the rubber cushions, use washers sized 32 mm O.D. x 2 mm thickness with 8.5 mm dia. hole.

The bolt used is the same as that used for the rear attachment.

Nuts should be selflocking elastic AN stopnuts, torqued to a value of 25-28 Nm (18-20 lbs/ft).

NOTE

The preload on the rubber cushions is pre-determined by the length of the spacer bushing in the middle, which in turn determines the degree of damping of vibrations to the airframe.

Therefore, the length of the bushing should not be modified.

During installation make sure that no part of the engine makes contact directly with the airframe motor mount or that there is no contact with the casting ears near the rubber cushions.

(FIG. 2-3 Front Engine Mount Attachment)

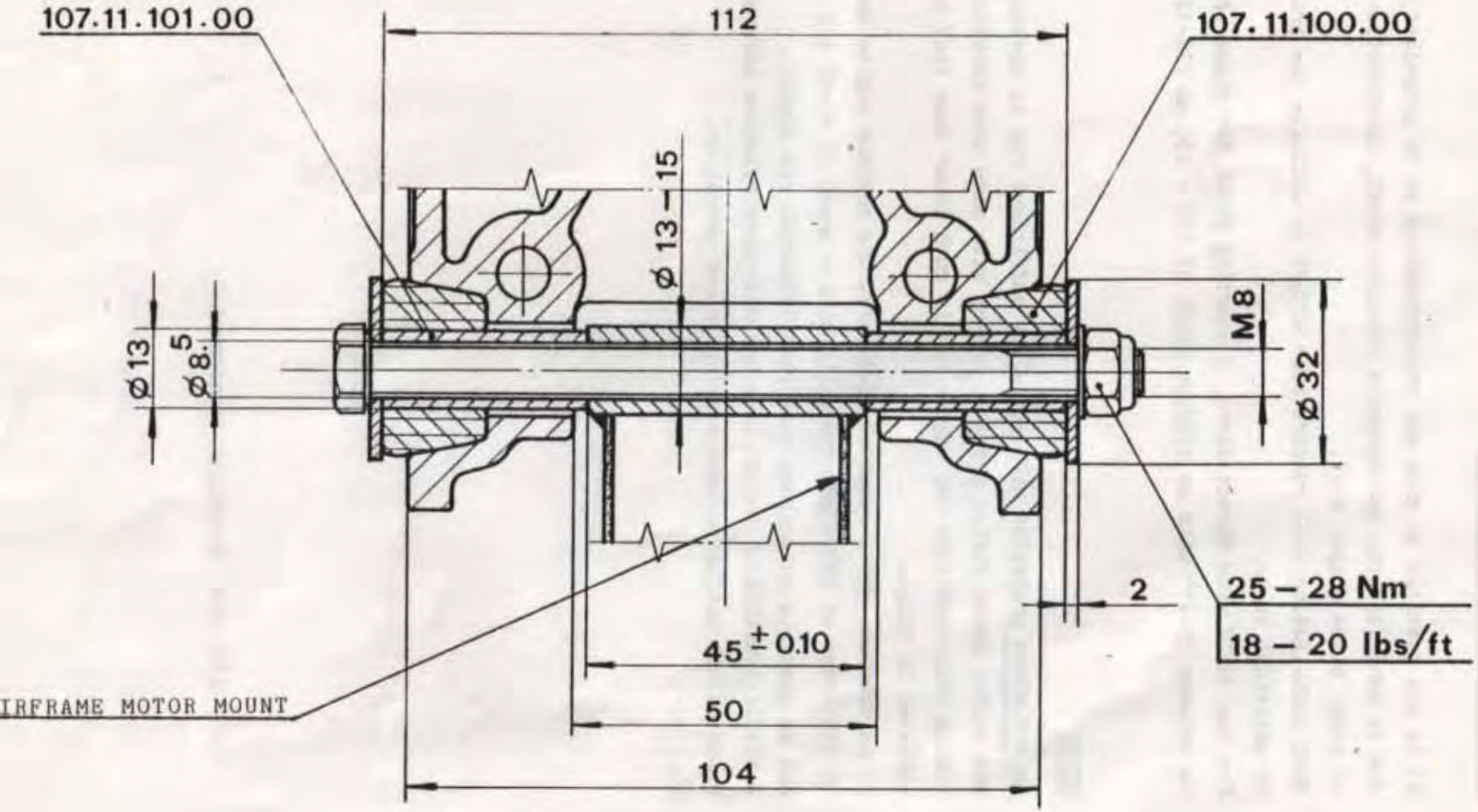

107.11.101.00
112
107.11.100.00
ø 13 – 15
ø 13
ø 8.5
M8
ø 32
2
25 – 28 Nm
18 – 20 lbs/ft
45 ± 0.10
50
104
IRFRAME MOTOR MOUNT

FIG. 2.3

2.4 PROPELLER INSTALLATION

It is not possible to give any recommendation as to propeller choice due to many factors, aerodynamics (vehicle speed, construction media of prop, blade shape, etc).
Each installation will require some effort to optimize the propeller, by empirical tests.
For the 107E with direct dirve, a starting point for diameter should be between 35-37" with an average pitch of 410 - 330 mm (16-13").

NOTE

An optimized propeller will not allow sufficient rpm to develop maximum engine power during a static run-up with wide open throttle.
During this condition the engine rpm is much lower than that actually achieved in flight.
As an example, for a speed of 15-20 m/s, the maximum engine speed is in the order of 5600-5800 rpm,while with a speed of 40-45 m/s it would not be possible to achieve more than 5200-5400 rpm static.
A static traction or thrust test can only give relative information which is not useful to define an optimized propeller.

(FIG. 2-4 Propeller Attachment)

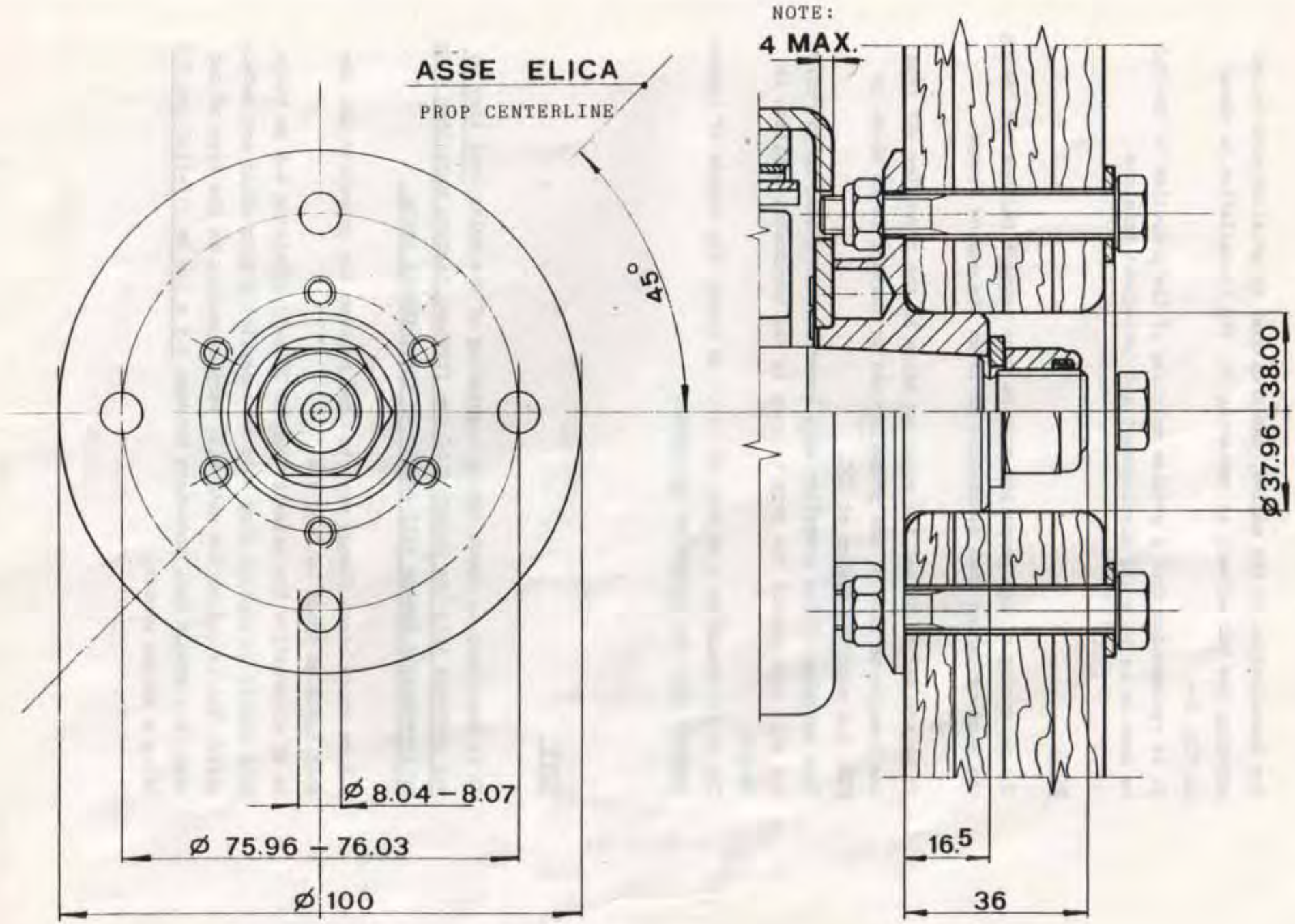

NOTE:
4 MAX.
ASSE ELICA
PROP CENTERLINE
45°
Ø 37.96 – 38.00
Ø 8.04 – 8.07
Ø 75.96 – 76.03
Ø 100
16.5
36

FIG. 2-1

For installation on the engine, the prop must be provided with holes matching the hub as well as centering it. The installation is shown in FIG. 2-4

It is recommended that a precise matching of the propeller to the hub be done so as to avoid misalignment and consequent imbalace.

NOTE

The balancing of the propeller must be done using a balance hub having the same centering boss dimensions as is on the engine flange.

It is advised to offset the mounting holes in the propeller 45° from the transverse axis of the propeller and to install it as shown in FIG. 2-4 with the piston at TDC.

This matching of the propeller will lower the vibrations in operation, and will also permit the prop to stop in the horizontal position in flight.

The bolts should be 8 mm dia. or 5/16" AN grade. The choice of length depends upon the propeller thickness.

NOTE

It is important to check during tightening of the bolts that they do not protrude into the interior of the flywheel magneto more than 4 mm or irreparable damage will result to the internal parts.

A 3 mm thick steel flange must be used between the propeller and the bolt heads as shown in FIG. 2-4.

As an alternative the material can be 2024-T3 aluminium 4-5 mm thick.

Nuts should be elastic stop nuts or castellated nuts which are safety wired. The torque on the nuts will vary depending on the type of nut used, but should fall somewhere between 1.5 e 1.8 Nm (11-12.5 lbs/ft) using a torque wrench.

USERS RECOMMENDATIONS

This manual contains a general description of the engine, basic standards for installation, operating requirements, and scheduled maintenance.

Component inspection and overhaul procedures are contained in the Overhaul Manual Part No. 107.00.007.00 (under printing)

A parts list containing spare parts order numbers is provided as a supplement to this manual.

The efficiency, performance, reliability, and durability of the KFM 107 is dependent upon how accurately the contents of this manual are followed. When in doubt, always refer to this publication.

2.5 CARBURETOR INSTALLATION

The engine requires the use of a carburetor of the diaphragm type equipped with a fuel pump and having a throat diameter of 34 mm on the manifold flange side.

Both inlet manifolds (28°, Part no. 107.07.020.02 and 45°, Part No. 107.07.020.01) are provided with ports that drive the fuel pump diaphragm.

The carburetor includes a choke as it is necessary, particularly for cold starts.

The carburetor is also provided with a compensation tube between the carburetor throat and the mixture control diaphragm.

The purpose is to provide mixture compensation for the additional dynamic air pressure caused by the propeller blast when the carburetor faces the propeller.

This eliminates difficulty in adjusting the carburetion, especially in the mid-range.

NOTE

The "compensated" carburetor can be recognized by the presence of a short angled tube in the carburetor inlet near the choke plate.

Before installing the carburetor on the manifold, remove the plastic shipping plug in the opening.

The flange gasket must be placed on the manifold with the hole for the fuel pump actuating pressure aligned with its corresponding hole in the manifold or the pump will not work.

The flange nuts are then torqued to 22-25 Nm (16-18 lbs/ft).

For increased engine durability, the special air filter is indispensable to avoid ingestion of wear-producing airborne particles.

The filter is attached to the carburetor with three screws.

The connection of the throttle control cable to the carburetor is conventional.

In order for the carburetor to function in any position, it must receive a continuous supply of fuel.

The fuel pump can provide lift of fuel up to a maximum head of 0.6 m (24").

The fuel tank should include a fuel shut off valve and filter on the fuel pick-up tube, or an in-line filter in the supply tubing.

2.6. EXHAUST SYSTEM INSTALLATION

As is well-known with 2 stroke engines, the performance is greatly influenced by the configuration and dimensioning of the exhaust system.

In particular, the developed length of the system determines the RPM at which the engine will operate in its normal use.

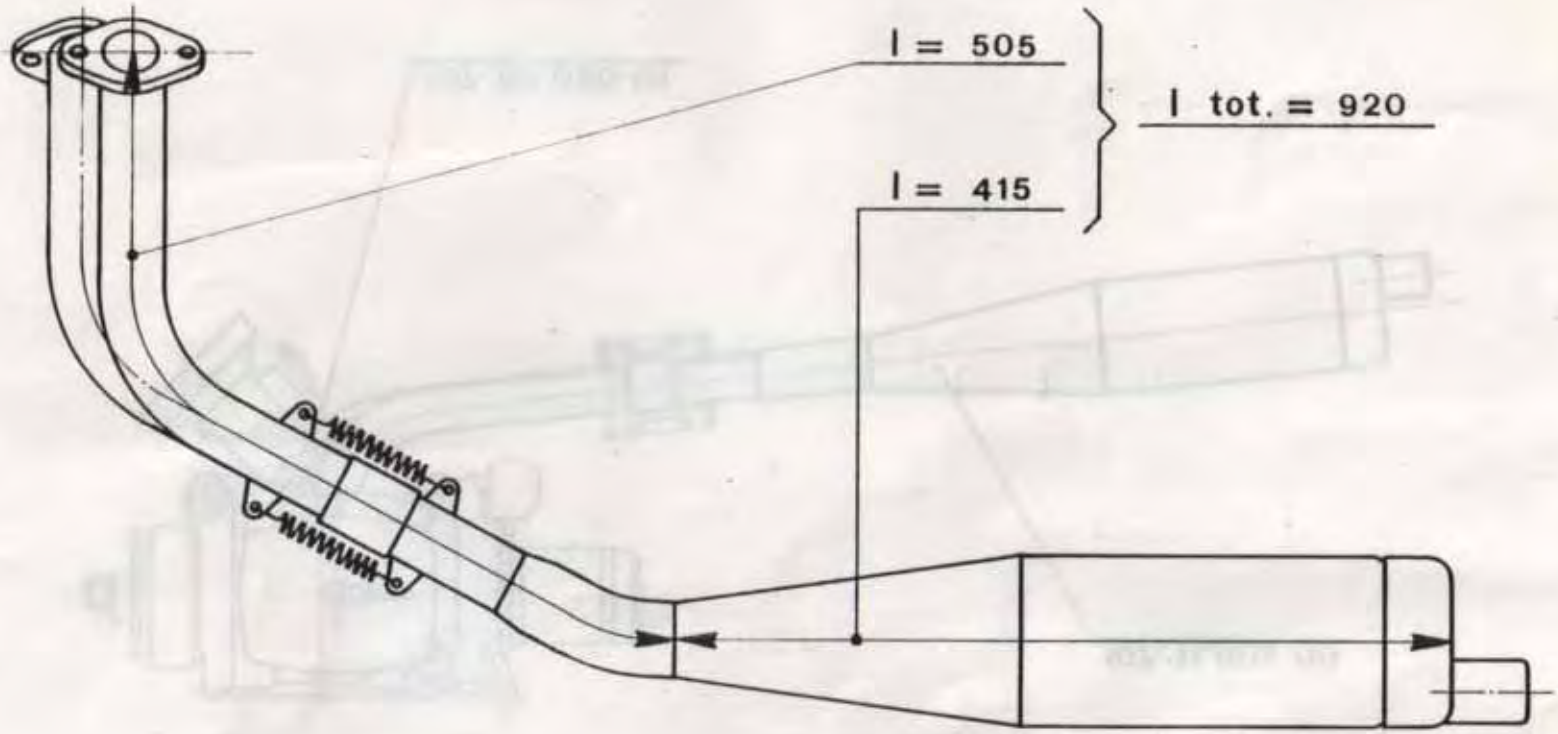
The system is tuned to the desired RPM at which maximum power is available.

That length, measured from the cylinder flange to the end of the expansion chamber (i.e., average length measured in center of tubing diameter) is 36.2" (920 mm.) for the left cylinder, which is the most rearward of the two pipes (see fig. 2.5)

This dimension is not to be altered! However, it is permissible to modify the shape of the pipe's curvature as required by the airframe design.

Two tipes of systems are available. The first is adapted for use with inlet manifold No. 107.07.020.01 (45°) and the second system No. 107.11.005.01 is intended for use with the 28° inlet manifold, nO. 107.07.020.02.

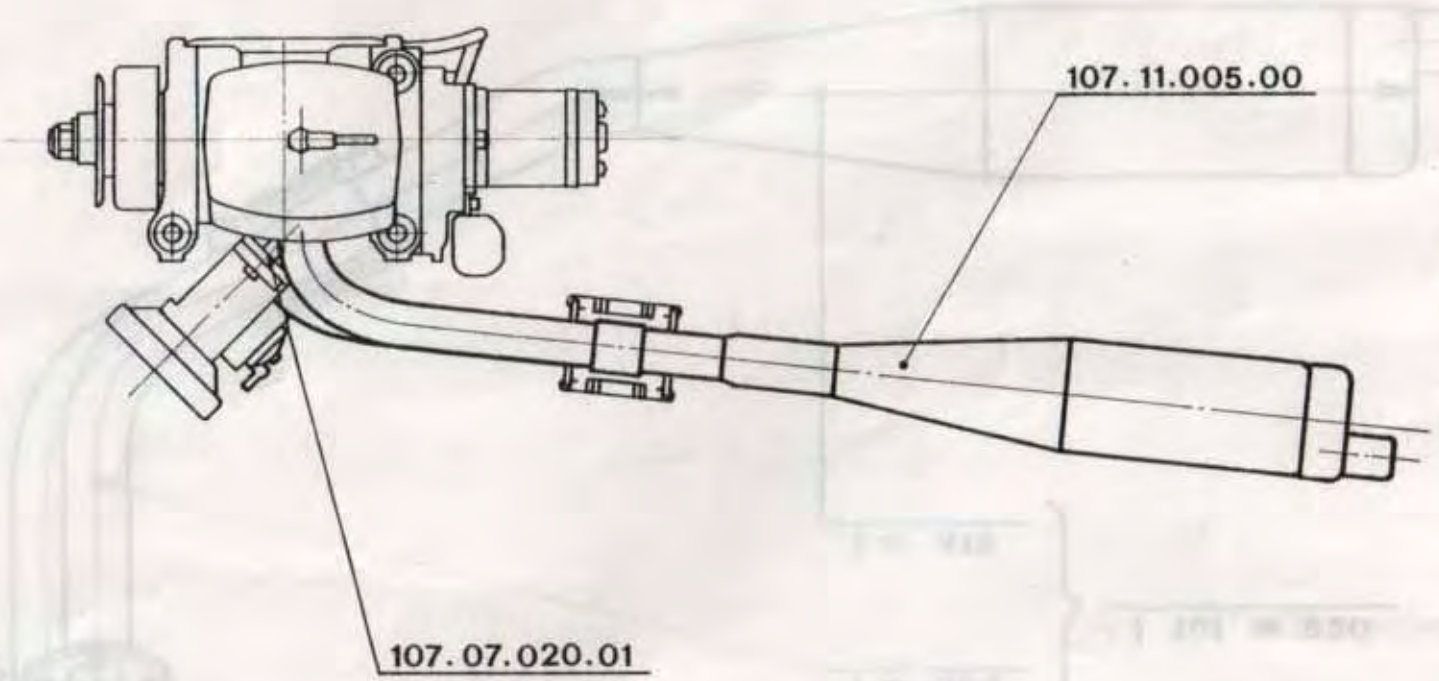
(FIG. 2-6 Exhaust System For Carburetor Toward Propeller)



NOTE: dimensions are in mm.

fig. 2.5

FIG. 2.6



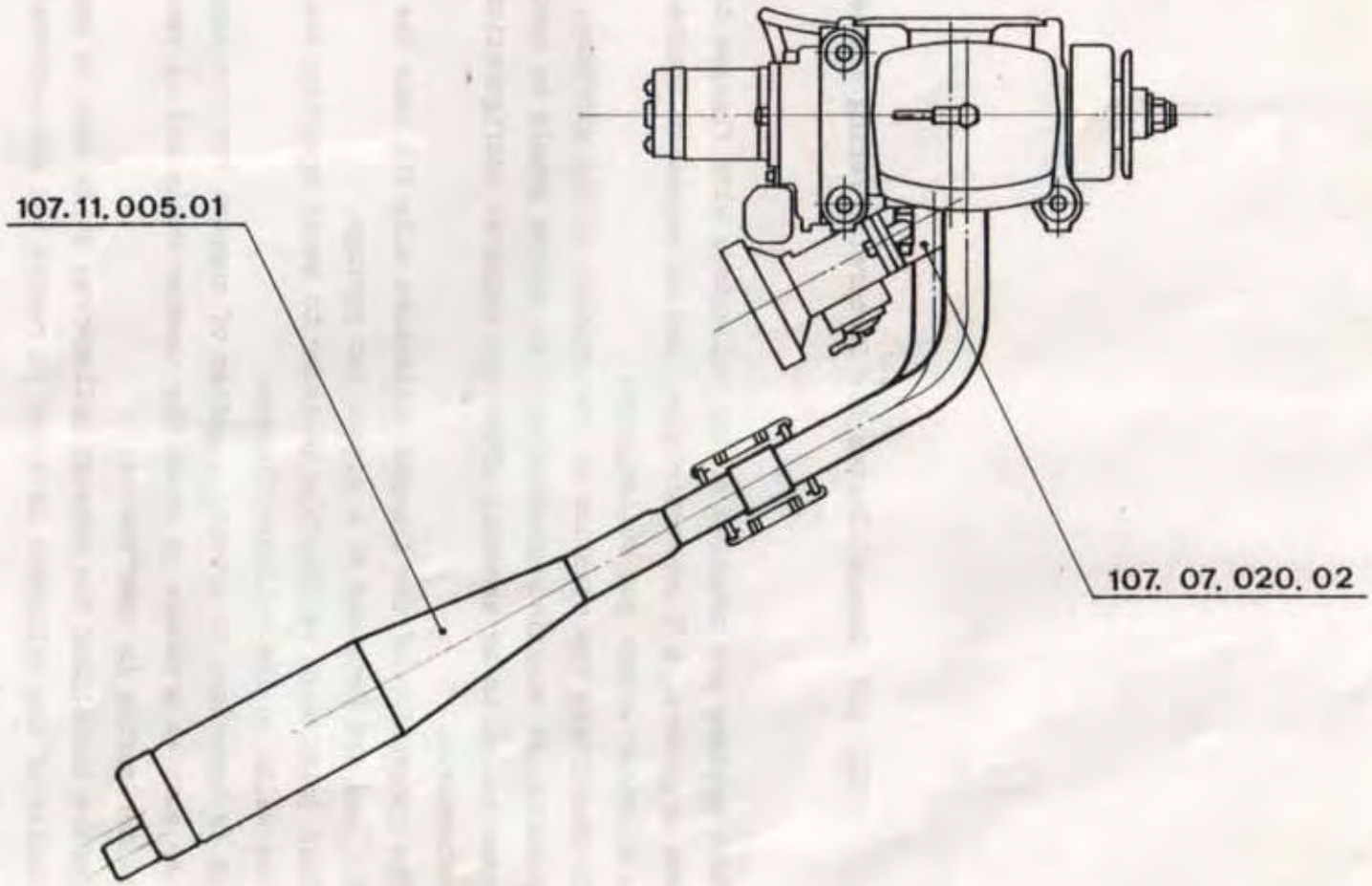


FIG. 2.7

(FIG. 2-7 Exhaust System for Carburetor Facing Rearward)

Both systems are composed of two collectors with flanges to bolt to the cylinders, a Y connector pipe, and an expansion chamber having a silencer within the outlet pipe.

To facilitate the adaption of the system to the airframe, the components are supplied unassembled. The system should be continuous seam welded as an assembly after the required configuration has been determined.

The connection of the flanged collectors slip fit into the Y connector and are retained by a sleeve and springs.

This joint must be flexible in order to avoid breaking the pipe or the welds on the cylinder flanges.

It is important to provide a system of support for the expansion chamber such as a saddle in which the chamber rests and is secured by retainer spring in compression.

Before installing the exhaust collectors, it is best to wash out the inside of the cylinders in order to remove the anti-corrosion protective oil.

Remove the plugs from the spark plug holes and the exhaust flanges. Bring the pistons to TDC. Inject 10-15 cc of a 5% gas/oil mixture with a syringe into each spark plug hole.

Turn the crankshaft a few revolutions and let the mixture drain out of the exhaust ports for several minutes after having again brought the

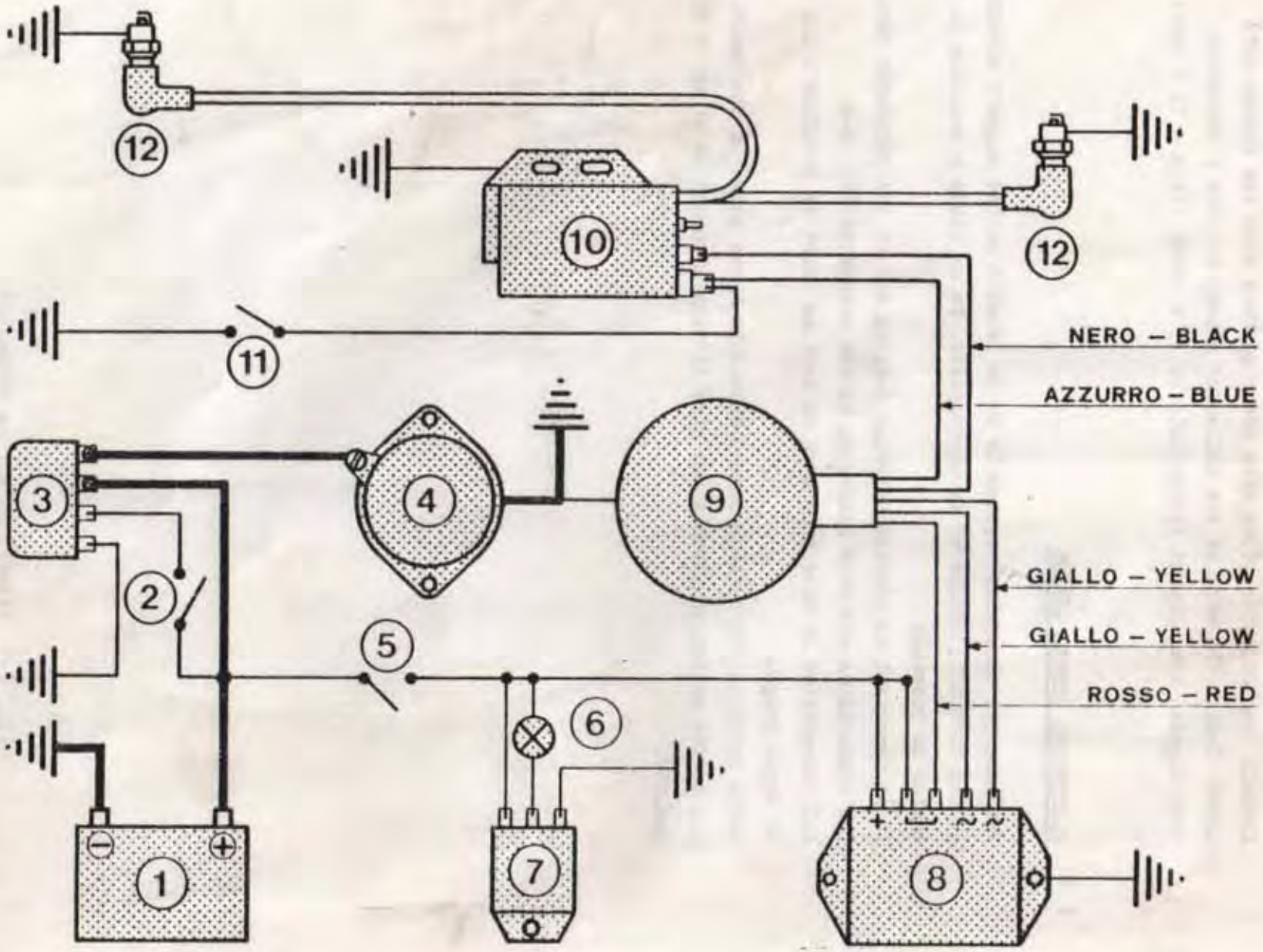
pistons to TDC.
Install the collector pipes with their gaskets with the flange nuts loose. Insert the ends of the collector pipes into the Y connector, then tighten the exhaust flange nuts to 17 e 19 Nm (12.3 - 13.7 lbs/ft).

2.7 ELECTRICAL SYSTEM WIRING

The external electrical system is to be located on the support structure or the firewall, whichever is appropriate, in as close a position to the engine as possible.
It is important to provide external cooling air to the regulator rectifier.
The connections are made according to the schematic FIG. 2-8.
All connections or wire runs must be kept as short as possible using wire of ample gauge.
Cable sections (wire gauge sizes) should be those shown in the table.
All of the switch components and wire terminals should be of An or MS quality.

(FIG. 2-8 Electrical Wiring Schematic)

FIG. 2.8


12
10
12
11
NERO – BLACK
AZZURRO – BLUE
3
4
9
2
GIALLO – YELLOW
GIALLO – YELLOW
5
ROSSO – RED
6
1
7
8

	COMPONENTS	PART No.
1.	BATTERY	
2.	STARTING SWITCH	
3.	STARTING RELAY	107.12.504.00
4.	STARTING MOTOR	107.12.500.01
5.	MASTER SWITCH	
6.	CHARGING SYSTEM LIGHT (optional)	
7.	CHARGING STATE MODULE (optional)	107.11.040.00
8.	RECTIFIER/REGULATOR	104.06.055.01
9.	MAGNETO/ALTERNATOR	107.06.002.00
10.	IGNITION H.T. COIL	107.06.030.00
11.	ENGINE KILL SWITCH	
12.	SPARK PLUGS	

CONNECTION	CABLE SIZE A. W. G.
BATTERY to ENGINE GROUND	8
BATTERY to START RELAY	8
START RELAY to START MOTOR	8
BATTERY to START SWITCH	14
SWITCH to START RELAY	14
BATTERY to MASTER SWITCH	14
MODULE to CHARGE LIGHT	16
BATTERY to REGULATOR	14
REGULATOR to ALTERNATOR	14
MAGNETO to H.T. IGNITION COIL	16
IGN. COIL TO ENGINE KILL SWITCH	16

NOTE

As shown on the schematic, all of the external components are to be connected to the engine ground using the same screw.
Only the starter relay, which has an "AMP" terminal, can be grounded separately.
The connection between the battery negative post and the engine ground must be done using an 8 AWG wire having a crimped terminal secured to the engine rear cover by a 6 mm bolt near the coil attachment point.

The ignition system is completely independent of the battery charging system, and the engine will run even with the two yellow and one red wire disconnected.
The engine is stopped by means of the engine kill switch which grounds the magneto, preferably with a push-button switch.
The alternator has a capacity of 130 W at speeds above 5000 rpm, which corresponds to the lower useful engine speed.
The master switch (5) connected to the battery and rectifier/regulator is used for the on-board electrical system.
The total on-board electrical load must not exceed the 130 W capacity of the alternator (10 A).

IMPORTANT

To avoid damage to the regulator!

The master switch must NEVER BE TURNED OFF WHILE THE ENGINE IS RUNNING.
The master switch is always to be turned on BEFORE the engine is started, and turned off AFTER THE ENGINE HAS STOPPED.
The master switch should be placarded with an appropriate warning, such as "Do not Turn Master Switch On or Off while Engine is Running".
The on-board battery can be of the lead-acid type, or of the sealed type having gelled electrolyte.
The capacity must be between 6 to 10 Ah, and must have a discharge capacity of from 80 to 100 Amperes.
A lower discharge capacity can cause difficulty in starting in cold seasons. To check the state of the battery and charging system, an optional device is available. It is a solid state module which drives an indicator lamp. The module 107.11.040.00 is shown in the electrical schematic.
It functions as follows: When prior to starting and the master switch is turned on, the lamp will make a brief flash, indicating that the battery charge state is OK. However, if the lamp stays on, it is a signal that the battery is not sufficiently charged (below 12.3v).
When the engine is running, the lamp should be off, indicating all is normal.
If the lamp remains on while the engine is running, it is a warning signal that the system voltage has fallen below 12.3v.

a) This indicates that there has been an alternator failure, defective or damaged regulator, or that the wiring connections are loose or not solid electrically.

DESCRIPTION OF THE ENGINE

The KFM 107 engine has been conceived for the motorization of superlight aircraft and for use as auxiliary power on sailplanes of limited wing loading.

As a matter of fact, from the basic version, used in either tractor or pusher modes, more complete units can be derived with the addition or substitution of special auxiliary groups.

The engine, a two cycle, is a two cylinder opposed, with 180° crankshaft. This solution allows low weight/power and bulk/ power ratios and it offers good dynamic balances which limit vibrations transmitted to structures.

The cylinders are cast in light alloys integrally with their respective crankcase half and the cylinder bores are hard metal plated.

The light alloy heads are separate and fastened with studbolts.

The built-up crankshaft made of C.H. alloy steel is supported on two ball bearings, and on the flange end on one roller bearing.

The con-rods are made of case hardened and hardened steel with roller bearings in both ends.

The ignition system consists of an electronic flywheel magneto, without contact breakers, and with dual external H.T. coil.

Induction is via a pack of six steel reed valves seated against rubber. The pack is directly fitted in the inlet duct located in the bottom of the engine, together with the diaphragm carburetor built into the fuel pump.

To obtain the best performance and low consumption a good exhaust system is required, and has to be in accordance with the factory requirements and construction guidelines.

It can also indicate that the system is running over-voltage and has exceeded the upper limit of 15.7v.
It indicates that the regulator has been damaged.

The starter switch should be the combined type having the rotary positions Off-On-Start (momentary contact). If not, then a push to start switch can be used.
The spark plugs are resistor type "Bantam" series with 3/8" (9.5 mm) reach. All of the development tests have been performed using the Champion RCJ 6Y type, which are well adapted to the engine operation.
The plug gap is to be maintained between 0.5 mm and 0.6 mm (0.20 to 0.24").

NOTE

Plugs of a lower heat range (such as RCJ 7Y) should not be used, since their thread reach is slightly too long for the 107.
Lubricate the plugs sparingly with anti-seize compound, screw them into the heads finger tight, then tighten to 20 to 24 Nm (14.5 to 17 lbs/ft) torque using a torque wrench.
Push the rubber connector elbow firmly down on the plug terminal.
To remove, use a counter clockwise twist while pulling outward from the plug.

2.8 COOLING

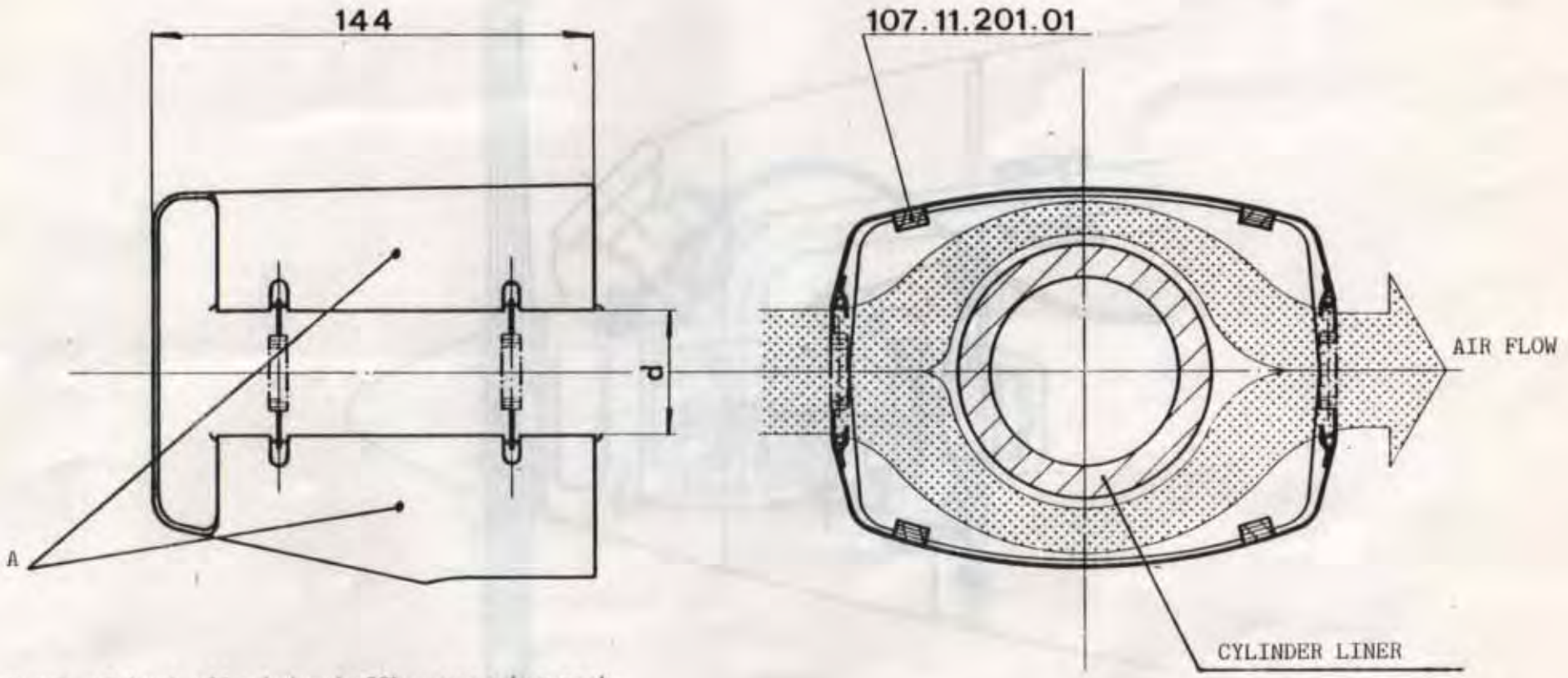
During the installation study, it is necessary to develop the most efficient method of cooling the engine.
In an installation without cowling or fairing, the prop blast on the cylinders may be generally sufficient for cooling.
However, the cylinders will have the tendency to assume higher temperatures on the downstream side of the air flow, and this could provoke localized overtemperatures, resulting in cylinder deformation.
Addition of a simple baffle or deflector as shown in FIG. 2-9 is the best solution as it directs the air to the rear of the cylinders.

(FIG. 2-9 Cylinder Cooling Baffle)

The baffles are easily made of sheetaluminium with a thickness of 0.25 or 0.30".
Each baffle shell is curved to fit the contours of the cylinder finning, and should contact the rubber antivibration strips.
Four springs secure the shells in position.
The dimension "d" for the front and rear openings are a function of the air velocity and must be defined during flight testing.
As a guide, with a tractor propeller, the inlet dimension should be from 40 to 50 mm (1.5 to 2"), while the exit dimension should be between 60 and 70 mm (2.4 to 2.8").
For a pusher application, which lacks the prop blast, these dimensions have to be increased about 25%.
Installations with a cowling have the advantage of using the cowling itself as a baffle system, with the second advantage being reduced drag. Other than the carburetor air inlet, the cowling need only have one or two holes, suitably positioned for the cooling of the exhaust system, in the central zone of the engine towards the inlet manifold.

NOTE

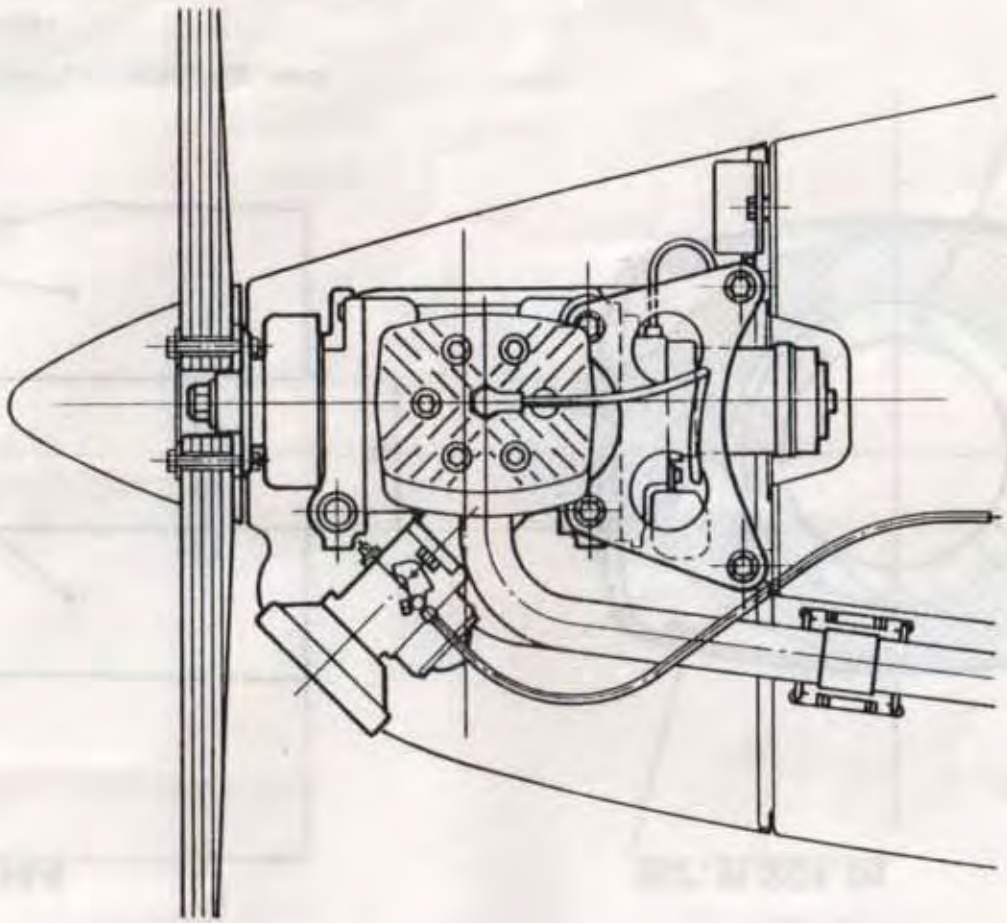
In the design of a cowling, one must consider the need for cooling air discharge outlets, which must always be larger in area than the inlet openings, and positioned in a low pressure zone.



A=Suggested set of sheet alluminium baffles wrapping each cylinder and retained by two springs.
Baffles are dampened by rubber dampers (107.11.201.01)

FIG. 2.9

FIG. 2.10 Typical Tractor Installation



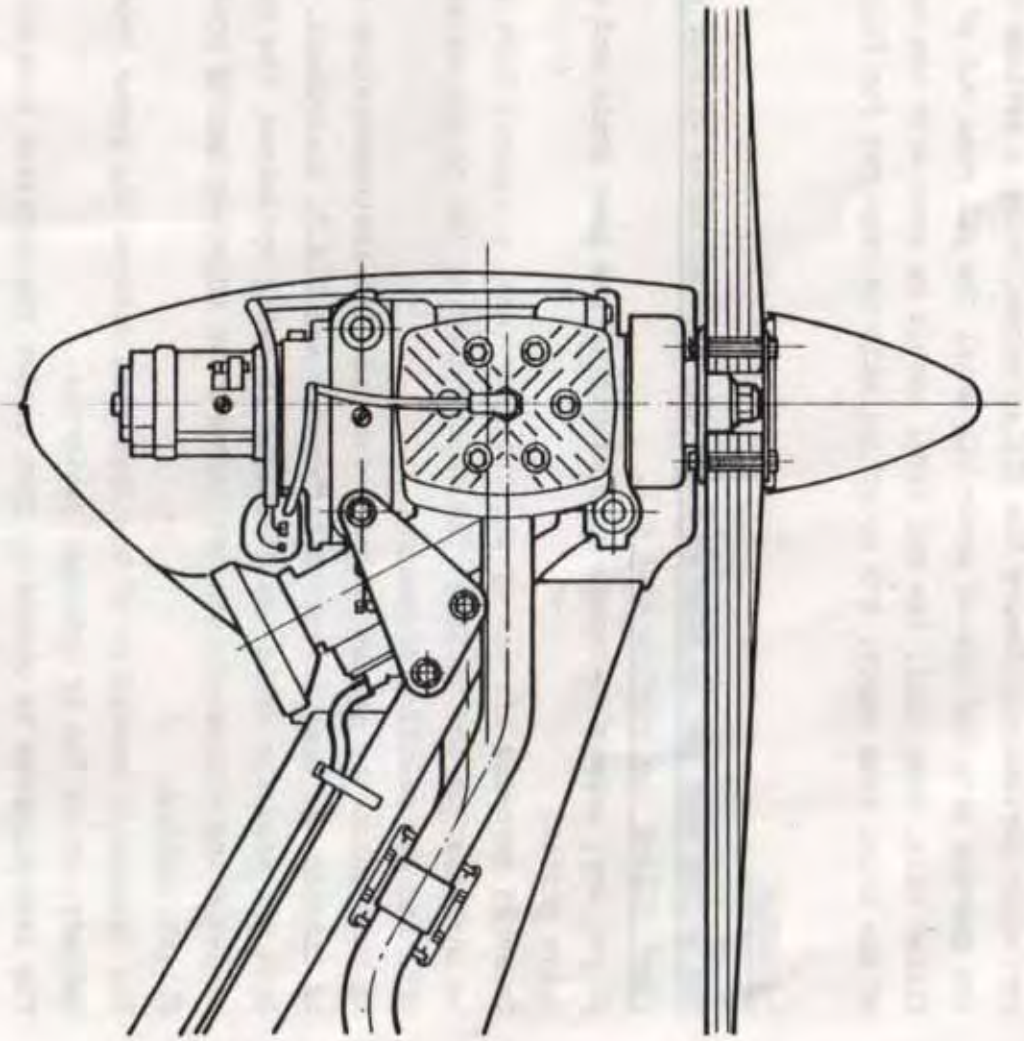


FIG. 2.11 Typical Pusher Installation

2.9 -PLACING THE ENGINE INTO OPERATION

Before starting the engine, the section containing the starter reduction gear must be filled with oil.
Filling is through a hole located on the right side of gear housing, marked with the word "OIL".
The hole serves as a full or level indicator. Make sure the engine is perfectly horizontal. Remove the filler screw. Using a syringe fill the gearbox with SAE 20W-40 motor oil until the oil runs out of the filler hole. When full, the oil level should be even with the bottom of the hole. From empty, 215 cc of oil will be required for filling.

IMPORTANT

The engine must not be started under any circumstances without having first filled the gearbox with oil.
If run dry, expensive damage will result to the gear train and starter drive clutch.
To avoid throwing oil out of the breather vent, a plastic tube should be installed on the fitting. The tubing need be 150 to 200 mm length, with its end pointing downwards.
At this point the engine is ready for use. The instrumentation required is limited and need be only a tachometer and C.H.T. instrument.
Both are valuable while the propeller is being optimized, the cooling system being evaluated, and the carburetion adjusted during preliminary flight testing.
The tachometer should be of the type that derives its power from the battery, or is fed by internal batteries.
The tach pulse can be picked up from either the ignition blue wire, or the alternator yellow wire, depending on the type of tach chosen.

NOTE

The tachometer should not be of the type that is deriving its power from the ignition coil secondary, since the energy absorbed to run the tach can disturb the ignition amplifier.

One thermocouple under the right cylinder sparkplug will furnish sufficient information as to cylinder head temperature, as regards cooling system behaviour, engine load, and fuel/air ratio (mixture). A washer type thermocouple with a 14 mm hole is used in place of the normal sparkplug washer.

SECTION 3

3.1 FUEL AND LUBRIFICANT REQUIREMENTS

The 107 engine is designed to operate on a mixture of premium gasoline (98 to 100 octane, Research method = RON) and a high quality two stroke motor oil in a ratio of 40:1 (2,5%).

NOTE

During the development testing good results were obtained using VALVOLINE 2 STROKE COMPETITION OIL - SAE 50 - Part No. 451 in the 40:1 mix ratio. This oil yielded low deposits and minimal varnish at the completion of durability tests.

Avoid the use of any motor oil packaged for four stroke engines or for automotive applications. These oils do not provide the self mixing capabilities of two stroke oils and they tend to settle out in the bottom of the fuel tank during periods of storage. Synthetic oils are not recommended at this time. At such time as new oils are approved by the KFM Division, notice will be made via the KFM "Support Bulletins".
The mixing of gasoline and oil should always be done in a separate container and not in the fuel tank. It permits accurate proportioning of gasoline and oil, and allows for a thorough mixing before it is poured into the fuel tank.

3.2 STARTING THE ENGINE

Before starting, a basic carburetor adjustment must be made.

a) Unscrew the idle speed screw until it is clear of the throttle lever. Now turn the screw in slowly, until it just touches the throttle lever. At this point the screw is turned in 1 1/2 turns.

b) Screw in the idle mixture screw lightly until it just bottoms or stops. Do not force the screw or the idle jet will be damaged beyond repair. At this point, unscrew the screw 1 1/2 turns out.

c) The high speed mixture screw is also turned in slowly until it stops. Back it out (open) 1 1/2 turns.

These are average values for all of the small carburetors currently in commerce today.

To start the engine:

d) Open the fuel supply valve.
e) Pull the choke control cable until the choke plate is fully closed.
f) Turn on the master switch.
g) Engage starter

During the first start, when the system is empty of fuel, the engine will have to be turned about 10 to 15 revolutions before the fuel system is primed.
At the first signs of firing push the choke control in partially, and keep the throttle closed. Once the engine has been running for 20 or 30 seconds the choke can be pushed fully in (open).
If the engine requires some throttle to keep running then the idle speed screw has to be turned in until an idle speed of 1800 to 2000 rpm is reached.
Now, the idle mixture screw should be adjusted for a smooth idle.
The adjustment of the carburetor will require repeated readjustments between the idle speed and idle mixture screws, until a smooth idle is obtained at the specified idle speed of 1400-1600 rpm.
These indicators may help in performing the idle adjustment.

The tendency for the engine to "4 stroke" can be reduced by a slightly lean mixture. A low idle speed will impair engine acceleration or throttle response when the throttle is opened rapidly.
If rich, the "4 stroking" will be pronounced and the engine will accelerate quickly up to a point - where after which the rpm will not increase. A good rule is to have the idle mixture slightly rich, in order to avoid the possibility of having the engine stop, and to allow better throttle response.

NOTE

All adjustments must be made with the air filter installed! If adjustments are made with the filter removed, the carburetion will be rich when the filter is reinstalled.

Adjustment of the high speed or "power" jet must be done using a tachometer.

The high speed adjustment is made with - hot engine, once the idle adjustments have been satisfactorily completed.

Initially, check to see how easy the engine responds to the throttle when opened smoothly and fully. A certain amount of sluggishness is an indication of a lean mixture and it is necessary to quickly open the high speed screw until the engine begins to "4 stroke".

Again, open the throttle smoothly until it is fully open, while watching the rpms obtained.. Continue this evaluation by slightly leaning the high speed mixture each time the throttle response is checked and the rpms read. This is continued until the mixture needs to be richened in order to obtain the highest possible rpms with the propeller installed. The best initial choice is where the carburetion is the richest possible but without an rpm drop.

Following the running in of the new engine a readjustment will be required.

NOTE

While optimizing the carburetion, it is necessary that the engine hold maximum rpm for a few seconds during each tachometer reading. For this reason a slightly rich mixture can prevent the risk of engine seizure, which can happen to new engines running lean.

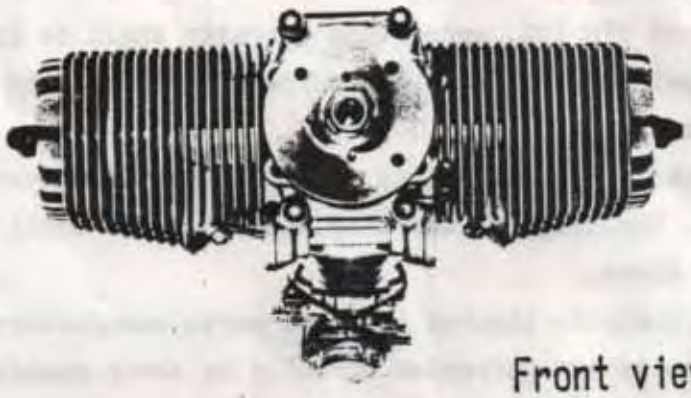
3.3 RUNNING IN THE NEW ENGINE

Each engine is run on the dyno for a brief "break in" cycle at the factory. During this period, the engine performance is measured to determine if it meets the acceptability criteria for release. It is always recommended that a new engine undergo light load operation by the operator for the first two hours of use before it is used in continuous operation. The first two hours should consist of a cycle of 1 minute full power then ten minutes at 50% power.

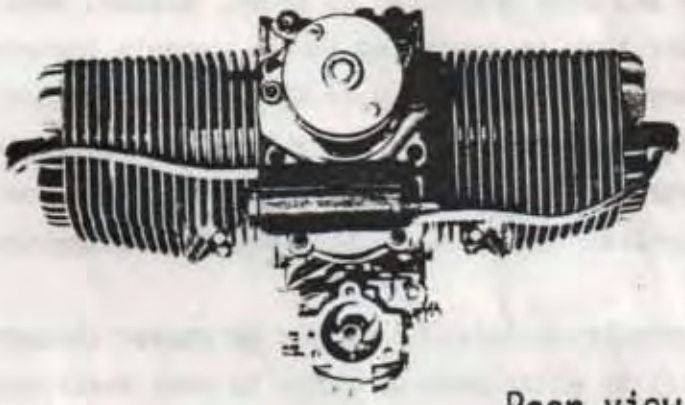
This cycle is alternated for the first two hours. This should be done following the carburetion adjustments. During this period, the gasoline/oil mix ratio should be 33:1 (3%).

Once the two hour period is completed the engine is ready for use.

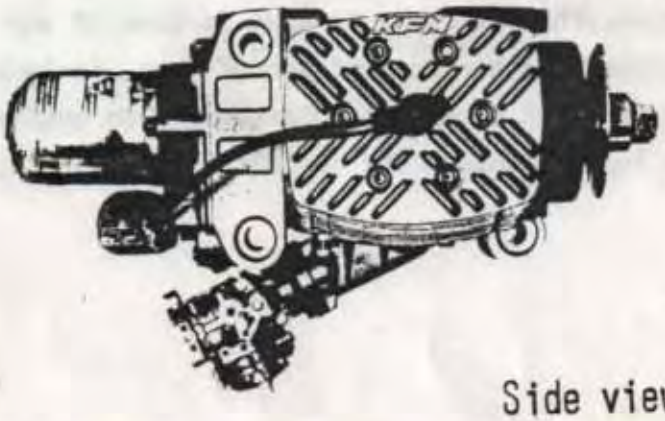
KFM 107



Front view



Rear view



Side view

Completed "break in" cannot be expected until the engine has accumulated between 30 and 40 hours of use. Following this period, the pistons, rings, cylinders, etc will have stabilized. Until then maximum performance cannot be expected.

3.4 OPERATING LIMITATIONS

Using either of the two factory exhaust systems, the engine will yield maximum power at 6200-6300 rpm.
Above this speed the power curve is flat until 6600 rpm, at which point the power reduction is sharp.

NOTE

Shortening the two primary exhaust collector pipes as little as 20 mm will raise the rpm needed to achieve full power. Lengthening the collectors will lower the rpm at which full power is reached, and also the amount of power produced. Any changes in the fixed lengths of the system will compromise the available power.
Full rated power may be used for up to 5 minutes, provided that the engine is fully hot and has an efficient cooling system. Using full rated power, the cylinder head temperature will increase rapidly, and if not watched, can exceed the maximum limit of 220-225° C (430-435° F).
Overtemperature can provoke detonation that is difficult to detect.
In some cases detonation can be seen as small continuous vibrations of the tachometer needle combined with a high CHT indication.

NOTE

Detonation, even for brief periods can cause serious mechanical damage leading to engine failure. The risk of detonation is also present at part throttle loads if gasoline of less than 98 (Research) octane is used.

U.S. RECOMMENDATION	Aviation Gasoline	Automotive Gasoline
For	use	use
98 Research Octane Number (RON)	"100 Octane" or "100 Low Lead"	"93 Octane" (posted) unleaded or leaded Premiums

For continuous operation at the 90% power setting (6000-6100 rpm), the propeller has to be perfectly matched to the engine/airframe so that the maximum air speed is reached at 6300 rpm.

With an optimized propeller and 90% power setting, the CHT should not exceed 200° C (390° F). Higher values are indicators of inadequate cooling or lean mixture. The windows in the cooling baffles may have to be enlarged, or the holes in the cowling may need more open area. If additional volume of cooling air does not lower the temperature, then the mixture is probably lean.

Once the carburetion if fine tuned, the fuel consumption in flight should agree with the curve in FIG. 1.2.

The best economy values are 75% power at 5600-5700 rpm giving 6.8 lt/hr. (1.8 gal/hr).

3.5 FUEL REQUIREMENTS (FOR U.S. ONLY)

Octane rating:

A gasoline's resistance to detonation or "knock" is noted by its octane rating. Purchase and use of correct octane fuel is essential to prevent "knock" which may eventually be harmful to your engine.
The higher the rating, the higher the ability to resist "knock".
Regular fuels have an octane rating range from 91 to 95 RON (Research Octane Number) or 86 to 91 CLC (U.S. Cost of Living Council).
CLC ratings on gasoline pumps in the U.S. This rating is determined in the following manner:

$$\frac{\text{RON} + \text{MON}^{*}}{2} = \text{CLC OCTANE}$$

For example: Research Octane Number and Motor Octane Number divided by 2 equals Cost of Living Octane.
The CLC octane rating is 4 points less than the RON rating:

91 RON = 86 PUMP OCTANE
96 RON = 91 PUMP OCTANE

Use of fuels with octane ratings lower than 98 RON or 93 CLC cannot be used.

* Motor octane number

SECTION 4

4.1 SCHEDULED MAINTENANCE

Following the simple maintenance standards will allow the engine to perform more reliably and have a longer life.
Engine life is determined, not by a given number of hours, but by the wear limits prescribed for the main moving parts, beyond which an overhaul is required.
Premature wear of pistons, rings, cylinders, bearings, crankhshaft, and rods are indicators of improper operation resulting from poor lubrication, extreme temperature escursions, and/or extreme load changes. A properly used and maintained engine can normally be expect ed to exceed 500 hours of use without malfunction or significant power loss.
Maintenance is normal in nature and limited to the following.

A. CLEANING THE ENGINE

Frequent cleaning of the engine offers two benefits;

i Removal of deposits that impede cooling. A clean engine cools better.

ii A visible inspection of the external parts which may reveal hidden damage or loose fasteners creating oil leaks.

B. CARBURETOR

i Every 30 hours the air filter should be cleaned by removing the foam filter media and washing it in gasoline then blowing it dry with air.

ii Replace the fuel supply filter every 30 hours.

iii Lubricate the cables and ball joints of the throttle and choke controls with a few drops of oil.

C. IGNITION

The magneto does not use any mechanical rotating parts, therefore adjustment is not required, nor will the timing change with use. It is only necessary to inspect the H.T. ignition cables and their connectors to the spark plugs.

Every 50 hours remove the spark plugs and examine them for electrode wear, insulator erosion, and deposits. The plug end color will indicate if the fuel/air mixture is correct. Clean the plugs and reset their electrode gap to the prescribed clearance. Plugs must be replaced if they show signs of cracks, excessive gap growth, or fouling. Every 100 hours install new plugs.

D. ENGINE MOUNT

Frequently check the engine mount bolts for tightness. Check the condition of the rubber mount cushions for deformation, cracking or softening due to fuel or oil exposure. If in doubt replace them.

E. STARTER GEARBOX

The oil level in the gearbox should be checked as part of daily preflight inspection. A drop in the oil level can be due to leakage out the breather tube, leakage at the gearbox cover joint, or at the seal separating the crankcase from the gearbox.
In the first case, the remedy is to raise the end of the breather tube. For the other two problems, the engine should be sent to a KFM support center for repair, as they are equipped with all of the special tools required.

F. EXHAUST SYSTEM

Every 30 hours check that the exhaust flange nuts are tight and that the flange gaskets are not leaking or burned. When replacing gaskets make sure that the cylinder, exhaust pipe and exhaust flanges are flat.

If not, any distortion must be corrected before installing new flange gaskets. Torque the flange nuts as prescribed.
Check that exhaust pipe, expansion chamber supports, and retainer springs are in proper condition.
Every 100 hours, remove the end of the expansion chamber and remove the deposits from the internal cone, as they will create a reduction in power.
Every 200-250 hours the complete exhaust system must be decarbonized and cleaned thoroughly, including the two collector pipes. While the system is disassembled, take the opportunity to inspect the exhaust ports in the cylinders, as there will be an eventual need to completely decarbonize the cylinders.

The cylinder decarbonizing procedure is described in the Shop manual. Deposits accumulations in the exhaust system and in the exhaust ports indicates that:

a) The motor oil being used in the fuel mix is not well suited for the engine.

b) An excess of motor oil has been added to the fuel mix.

c) Carburetion is set too rich.

G. FASTENERS

Every 30 hours check that the propeller bolts are tight.
Every 100 hours check that the engine bolts and nuts are properly torqued.

H. CYLINDERS

It is good practice to check the condition of the pistons, rings, and cylinder bores every 50 hours by means of a compression test. This can be done at the same time as the spark plugs are inspected. The test is done using a compression gauge that has a recording needle or traces on a paper chart (Motometer).
To test, the engine must be cold. Crank the engine with the electric starter. Minimum pressure for both cylinders is 9 bar (128 psi). If not, send the engine to a KFM Support Center.

SUMMARY OF SCHEDULED MAINTENANCE

Every	Maintenance Required
Daily Pre-Flight	Engine mount condition
	Starter gearbox oil level
Frequently	Clean engine, as required
30 hours	Clean air filter
	Replace fuel filter
	Lubricate throttle and chocke controls
	Exhaust flange nuts
	Propeller bolt tightness
	Inspect spark plugs (50 hours)
	Cylinder compression test (50 Hours)
	Inspect H.T. leads and plug connectors
100 hours	Replace spark plugs
	Decarbonize expansion chamber
	Torque all engine bolts
200 hours	Decarbonize complete exhaust system
	Inspect port deposits

Note: All engine maintenance should be entered in the Engine log book as a good housekeeping practice.

4.2 STORAGE PRESERVATION

When a long period of storage is foreseen, it is necessary that the engine be preserved against internal corrosion.
Here is how it is done:

a) Remove the air filter element.

b) Start the engine and run it until it reaches normal operating temperature.

c) While running, squirt motor oil (that used for fuel mix) into the carburetor air inlet. Continue until the engine stops.

d) Wrap adhesive tape around the air filter inlet to seal it tightly. Seal the exhaust outlet with tape or a suitable plastic plug. Be sure to complete all of the external sealing before the engine cools down.

e) Disconnect the fuel line from the carburetor and drain out any residual fuel from the carburetor.

f) Remove the propeller and grease the hub, flange, and bolts.

For external protection the engine should be cleaned with degreaser, dried, and then sprayed with a light film of protective oil.
Cover the engine with a heavy plastic bag to prevent contamination during storage.

LIMITED WARRANTY

KFM INC. warrants each new KFM engine to be free from defects in workmanship and materials for six calendar months from date of delivery to the first purchaser when operated in accordance with the operation limitations and the owners instruction manual.

The obligations of KFM INC. under this warranty shall be limited to the replacement of repair of any parts determined by KFM INC. or their Representative to be found defective.

Replacement of parts under warranty does not entitle the owner to extension of the warranty. The original warranty remains valid until its expiration date, as stated above.

The KFM INC. warranty is limited to those parts manufactured by KFM INC. Accessory components are warranted directly by their manufacturers through their commercial networks.

No claims shall be allowed if in the opinion of KFM INC. or its Representative the engine has been subjected to abuse, misuse, modification, maintained or operated other than as specified in the owner's instruction manual.

No agreement varying this warranty or KFM INC. obligation will be binding unless specifically authorized by KFM INC. or its Representative.

KFM INC. reserves the right to modify its products and/or their specifications without prior notice, and without incurring any obligations for products previously sold.

The KFM INC. warranty is extended to the purchaser through KFM's distributors and importer (s). No additional warranty to that described above shall be made on behalf of KFM INC.

This warranty is in lieu of all other warranties expressed or implied, including but not limited to any warranty of merchantability or fitness for any particular purpose. This warranty is also in lieu of any other obligation, liability, or claim, whether in contract of tort, including any right in strict liability in tort or any right arising from negligence on the part of KFM INC. or its Representative for any direct, incidental, consequential, or other damage.

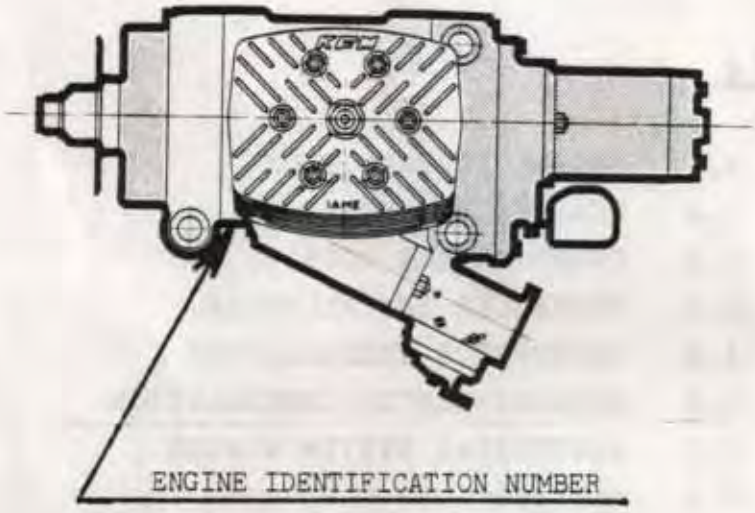
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SECTION 1

1.1 ENGINE IDENTIFICATION

The official engine identification number can be found stamped in the lower part of the left cylinder on the surface to which the inlet manifold is attached.
The number is included between two stars. Other numbers stamped into the same surface or on other surfaces of the engine are insignificant and will not identify the engine.



ENGINE IDENTIFICATION NUMBER

The engine identification number must always be quoted when ordering spare parts.

1.2 ENGINE DESCRIPTION

The KFM 107 engine has been specifically designed and developed for application to light experimental aircraft which use a propeller for propulsion. Considering the application of engines to vehicles of various speeds, the basic design provides for two versions of the 107 :

KFM 107E, with electric start capability and direct drive.

KFM 107ER, with electric start capability and belt driven reduction drive.

Either version may be used in tractor or pusher installations according to method of mounting.
The engine is an opposed two cylinder, two cycle with 180° crankshaft. The cylinders are integrally cast as a part of the crankcase halves in light alloy with chrome plated bores.
The cylinder heads are separate and secured with studs.
The crankshaft is a built up assembly and is supported by two ball bearings and one roller bearing on the flange end.
Heat treated alloy steel is used in the crankshaft and connecting rods, the latter having needle bearings in both ends.
Ignition is achieved by a solid state electronic flywheel magneto and external dual H.T. coil. Integrated with the magneto is an alternator providing on board battery recharge capability.
Starting is provided by an electric motor driving a double reduction torque multiplying gear train. Starter drive engagement is positive by means of free wheeling clutch.
Induction is through reed valves located in the bottom of the engine. In the standard configuration the inlet manifold is angled downwards 28° toward the rear (starter end) of the engine.
If necessary for certain applications, an optional manifold of 45° is available if required when locating the carburetor toward the propeller end. A diaphragm carburetor is provided that incorporates a fuel pump.
The engine is designed to give its rated power when fitted with a tuned exhaust system as described in detail further on in this manual.

1.3 GENERAL CHARACTERISTICS

CYCLE	=	2 Stroke
CYLINDERS	=	Horizontally Opposed Twin
BORE X STROKE	=	60 X 52 mm
STROKE/BORE RATIO	=	0.81
DISPLACEMENT	=	294 cm^3 (17.94 CI)
COMPRESSION RATIO	=	11:1
ROTATION, VIEWED TOWARD HUB	=	CCW (left)
IGNITION	=	Flywheel-magneto "MOTOPLAT"
IGNITION ADVANCE	=	BTDC 22-23°
SPARK PLUGS	=	CHAMPION RCJ-6Y
ALTERNATOR	=	12V-130W
STARTER	=	"MOTOPLAT" 12V-0.3KW (0.4 hp)
CARBURETOR	=	Diaphragm Type With Fuel Pump
FUEL/OIL MIX	=	2.5% Oil (40:1)
WEIGHT, DRY	=	18.7 kg (41.2 lbs)

Engine weight includes prop hub, carburetor, air filter, ignition coil, H.T. harness. Not included as engine weight are starter relay, regulator/rectifier, mounting hardware, or exhaust system.

1.4 PERFORMANCE

MAX. RATED POWER (5 minutes)	=	18.6 KW (25 hp) at 6300 rpm
MAX. CONTINUOUS POWER (90%)	=	16.8 KW (22.5 hp) at 6080 rpm
M.E.P. Max.	=	6.26 kg/cm^2 (89.03 lb/in^2)
FUEL BURN at 75% POWER	=	6.8 l/h (1,8 gph)

Data shown in FIG. 1.2 are corrected for standard conditions, with optimized exhaust system, but without dynamic air pressure at carburetor inlet.

KFM 107 ENGINE

Installation, Operation and Maintenance Manual

KFM INC.

Part n° 107.00.006.00

Issue May 1st, 1982