MISTRAL

USER'S MANUAL

FLIGHT MANUAL

MAINTENANCE MANUAL

FOR MISTRAL FROM NB. 41

AVIASUD ENGINEERING

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Bureau d'étude et construction d'avions ultra-légers.

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D I S C H A R G E

Flying an ultralight/microlight, even in the best conditions, may have certain risks, that the user of this aircraft declares to know.

The user commits himself to read the User's Manual (Flight Manual and Maintenance Manual) before his first flight aboard the MISTRAL. He will follow the indicated orders scrupulously.

He commits himself to apply the compulsory modifications communicated by AVIASUD ENGINEERING scrupulously, by means of the periodical news bulletins.

He will not apply any other modification or repair without the written permission of the builder, otherwise, the warranty will be void.

He recognizes to have an ultralight/microlight license and, if possible, a private pilot license.

The company AVIASUD ENGINEERING cannot be responsible of incidents or accidents resulting from a wrong assembly or a dangerous use of the aircraft, namely flights in bad meteorological conditions, aerobatic manoeuvres, and use of the aircraft outside the flight envelope.

....

(Date) (Place)

(Signature)

Name and address of owner:

Type of aircraft:

Serial number:

Dear Fellow Pilot,

We congratulate you on becoming the owner of your very own MISTRAL and we wish you many happy hours ahead.

This flight and maintenance manual is to permit you to operate your MISTRAL in total safety. Read very carefully the chapters on assembling, adjustments, operation (pre-flight inspection and flight) and periodical checks (airframe and engine). These chapters are not only a series of advices made to avoid you problems, but also several rules relative to maintenance and flight, which are of your responsibility. Aviasud Engineering is not responsible for incidents or accidents atributed to uncorrect maintenance or flight procedure. In particular, we inform you that the engine fitted on your MISTRAL is not certified "aeronautic" and, thus, you should be ready to land off-field in case of engine failure.

Do not forget that, once aboard your MISTRAL, you are the only master. Please fly carefully and responsibly. It is for your own safety, the safety of your passenger and other pilots and the continued good reputation of the microlight movement.

Happy flying !

Bernard d'OTREPPE,
Technical Manager.

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PART ONE

FLIGHT MANUAL

A) GENERAL POINTS

A.0. GENERAL DESCRIPTION

Your MISTRAL is a high performance ultralight aircraft which conforms to the French definition of ultralights.
It has a classic configuration, it is a biplane with a tractor engine. The dual-seater cockpit is open and has a windshield, it has 2 side-by-side seats. The lower wings and tail units are all-moving and insure roll and pitch control. Yaw control is achieved by a rudder. The 3 wheel-landing gear is fitted with a suspension on the 3 wheels and brakes are fitted on the main wheels.
The engine is a Rotax 532 type, twin-cylinder, two-stroke, water-cooled, single-carburettor.
The standard MISTRAL instrument panel includes A.S.I., altimeter, bank indicator, R.P.M. indicator, compass and water cooling temperature.
The fuel level can be seen from the cockpit.
Your MISTRAL has an integral dual control with a central stick.

STRUCTURE

a) Fuselage:
Monocoque structure with stiffening ribs and frames. Fiberglass/polyester composite for the fuselage, fiberglass-carbon/epoxy for the stiffening frames.

b) Wings:
- Monospar wings with ribs and P.V.F. covering.
Wingspars in Menzikal 7215.61. Ribs in cold-moulded laminated wood ribs and P.V.C. foam, root ribs and wing tips in fiberglass/polyester composite, thermoretractable P.V.F. covering.
- Attachment by 2 ball joint ends at wing root, by welded-steel parts at the interplane strut and the main strut.
- The lower wings have an antitab in carbon fiber/klegecell sandwich.

c) Tail unit:
- All-moving horizontal tail unit, with antitab/trim. Articulation and control connecting rod mounted on life-lubricated end bearings. Dismountable in 2 parts. 100 % mass-balanced in the fuselage. Monospar structure (light alloy), with wooden ribs and P.V.F. covering. Attachment by sleeving in the (steel) control tube, and locking by safetied nut.
- Rudder control by cables. Metal structure covered by P.V.F. film.

d) Landing gear:
- Main landing gear: leg in fiberglass/epoxy composite, with strut to insure suspension.
- Front landing gear: telescope nose-wheel of high resistance steel, with a spring strip and fork in fiberglass/epoxy composite.

e) Engine bulkhead and mount
Moulded in high temperature fiberglass/epoxy composite. Heat-resistant paint after polymerisation.

f) Dimensions

- Wingspan: 9,51 m
- Length: 5,66 m
- Length without propeller, rudder and rear tailskid: 5,14 m
- Height: - wings: 2,25 m,
  - fin and rudder: 2,07 m.

A.1. EMPTY WEIGHT 173 ± 2 kg

Standard version, with single-carburettor Rotax 532 engine, ready-to-fly, with instruments (A.S.I., altimeter, bank indicator, R.P.M. indicator, compass, water cooling temperature).

The following optional equipments are not included in the empty weight:
- parachute
- intercom with 2 safety helmets
- V.H.F. radio and battery
- electric starter and battery
- enclosed canopy
- heater

Empty weight of MISTRAL nb. on calculated kg
measured kg

A.2. MAXIMUM WEIGHT, LOADING AND CENTER OF GRAVITY (CG)

A.2.1. Maximum weight at take-off: 370 kg
A.2.2. Minimum pilot weight: 35 kg
Maximum 110 kg
Total weight of 2 passengers: max. 185 kg
Maximum fuel: 64 liters

A.2.3. C G
The authorised C G are within 11,7 % and 29,6 %. i.e. from 1506 mm to 1660 mm.

a) Measuring the C G at gross weight
Put the loaded MISTRAL on 3 scales of same height, on a horizontal floor.
P_A = weight under the front wheel
P_B = sum of weights under the main wheels

$$CG_{mm} = \frac{(458 \times P_A) + (1882 \times P_B)}{P_A + P_B} \quad \text{in mm}$$

$$CG_{\%} = \frac{CG_{mm} - 1405}{860} \times 100 \quad \text{in percent}$$

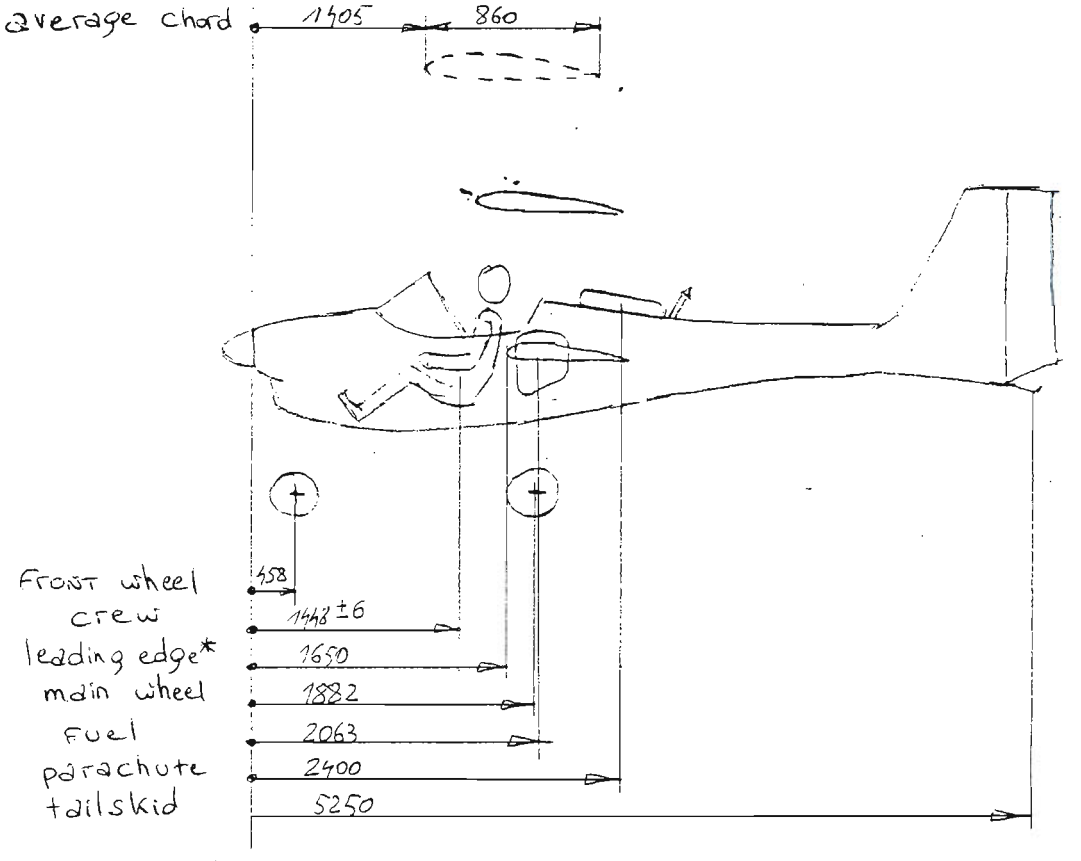
b) Measuring the empty C G
This is needed if you want to determine your C G in all loading cases rapidly.
Do the same as in a) with the engine levels checked, all the equipments fitted (parachute, other options), and the fuel tank empty.
You find: - the empty weight of the loaded aircraft in kg,
- the CG_{empty} of the loaded aircraft in mm.

c) C G calculation

CG_{mm} = (sum of all the elements' momentum) / sum of the weights

with the element momentum = weight of the element in kg x its abscissa in mm

Herebelow are a few examples of C G:



* measured at its intersection with the Fuselage

Element	Weight (kg)	Abscissa (mm)	Case 1	Case 2	Case 3	Case 4	Case 5
Empty airframe (with cushions)	175,1	1567	175,1	---	---	---	175,1
Airframe with parachute	182,1	1599	---	182,1	182,1	182,1	---
Fuel	0-46	2063	0	24	46	46	45
Crew	35-185	1448	185	154	50	35	150
Additional equipment							
Luggage							
Total weight 370,1			360,1	360,1	278,1	263,1	
CG_{mm}		1506	1566	1649	1660	1579	
$CG_{\%}$ average chord		11,72	18,74	28,32	29,65	20,24	

The flight tests covered the CG range 8,14 % - 30,8 %

B) PERFORMANCES AT MAXIMUM WEIGHT

B.1. Stall speed: 60 km/h
Minimum speed at which level flight may be maintained: 62 km/h

B.2. Take-off distance, no wind, altitude 10 m, temp. 18 deg. C., grass runway.

	propeller 1725 x 1000	propeller 1680 x 1100
take-off run	73 m	87 m
take-off (50 ft obstacle)	200 m	215 m

B.3. CLIMB
Indicated speed: 85 km/h - Propeller 1725 x 1000 3,3 m/sec
1680 x 1110 2,97 m/sec
Timed measure between 0 and 600, average temp.: 20 deg. C.

B.4. Landing on a grass runway - very slight use of brake
From 50 ft obstacles: 300 m (18 deg. C.)
Ground run 140 m

B.5. BEST GLIDE RATIO (DEAD STICK)
At 370 kg: glide ratio 9,7 at 81 km/h
At 300 kg: 9,5 at 73 km/h

Comments
a) The take-off length (50 ft obstacle) may be improved by taking-off later, i.e., at approx. 75 km/h instead of 65.
b) The 50 ft obstacle landing distance may be shortened by a sideslip, low wing in the wind. Training is needed.
c) In case the engine stops, the greater the glide ratio, the better the probability to find a suitable field. What counts is the ground glide ratio. This is better downwind. If needed, it may be wise to look for a field downwind. However, do not forget to land in the wind.
d) Remember that performances vary with altitude and temperature: the higher you are, and/or the hotter it is, the longer your take-off and landing distance. On the contrary, at a given weight, in straight level flight, the indicated stall speed will always be the same.

B.6 CONSUMPTION
Consumption may vary according to the carburettor adjustment and propeller.
For information only, with one passenger, the best measured consumption was 6,2 l/h at 80-85 km/h.
At 370 kg, consumption is of 10 l/h at 100 km, 16 l/h at 120 km/h. At full throttle, consumption is between 22 and 25 l/h.

Foresee your consumption taking the wind into account, and always have a sufficient safety margin in case of unforeseen change in weather conditions. Do not forget that, if you are lost, you will consume a few liters of fuel before finding your way. Finally, NEVER land with less than half an hour of fuel. If you are short-petrol, look for a field and land before running out of fuel. This will enable you to make a better choice, and an overflight of your field to examine it carefully. Once you make up your mind, fly in circles: you will drift. This will give you the wind direction.

C) FLIGHT QUALITIES (manoeuvrability and stability)

C.1. Flying the MISTRAL is similar to flying a light aircraft. A notable characteristic is the total absence of adverse yaw.
Stability is positive at all C G, and at all speeds.
A trim enables to balance the stick forces at all C G in the range of 70-140 km/h.
Stalling is preceded by a vibration in the stick, due to a partial stalling of the lower wing root (which is connected to the stick).
At high angles of attack, the MISTRAL must be flown with rudder.
If you move the stick roughly when approaching stall, the MISTRAL will spin. You just need to release pressure on the stick to stop the spin. At all C G, the MISTRAL stops spinning spontaneously (1/4 to 3/4 turns according to the spin rate), if all controls
are released. Your MISTRAL will recover itself, according to the trim adjustment, and will start to turn on the opposite side of the spin.

Reminder:
a) Although many spin tests were done, spins are not within the MISTRAL allowed flight envelope.
b) No stabilised spin tests were done.
c) The universal technique to stop a positive or negative spin is: release the stick and apply rudder pedal pressure opposite to the spin rotation.

C.2. DEMONSTRATED CROSS-WIND, ONE PASSENGER
- at take-off: 20 knts = 37 km/h
- at landing: 16 knts = 30 km/h

At gross weight, the limits are higher.

Note: the cross-wind limit also depends on the pilot skil and experience.

C.3. SPEEDS (all values in indicated air speed)

	Take-off weight	
	290 kg	370 kg
- Stalling speed	50 km/h	60 km/h
- Best climb speed	85 km/h	95 km/h
- Cruising speed		
- at 55 % power (recommended cruise)		105 km/h
- at 75 % power		120 km/h
- Maximum level flight speed		135 km/h
- Manoeuvring speed = maximum speed in rough air (it is prohibited to turn the controls completely over this speed)		125 km/h
- V_{NE} = never exceeded speed		165 km/h

D) STRUCTURE

D.1.1. Maximum load factor + 3,8 g (positive)
- 1,52 g (negative)

D.1.2. Maximum nose-up angle 30 deg.
nose-down 30 deg.

D.2. MAXIMUM LOADS ON THE CONTROLS

- below 120 km/h: of no concern, provided the load factors are respected ;
- over 120 km/h: the travels must be smooth to avoid excessive load factors.

E) ENGINE : ROTAX 532 - 1 CARBURETTOR

E.1. Maximum power: 58 HP at 6500 RPM
Maximum speed: 6500 RPM

E.2. Maximum propeller speed: 2500 RPM

E.3. Gear reduction drive with torque dampener, in oil.

E.4. NOISE LEVEL MEASURED AT FULL THROTTLE

Think of your airfield' neighbours !

Measured noise level $L_a = 88,3$

Reference noise level $L_r = 88,7$

Height $H = 34$ m

The noise perceived at the height h = $L_h = L_a - 22 \log \frac{h}{H}$

that is to say: if you fly twice as higher, the perceived noise is reduced of 6,62 dBa, but it will be heared longer.

Conclusion: avoid to fly slowly at full throttle over sensitive neighbours.

Noise level at level flight, gross weight, economical cruise

Height 150 m

Noise level 64 dB

F) ASSEMBLING, ADJUSTMENTS AND EQUIPMENT

F.1. ASSEMBLING AND DISMANTLING

Note: the MISTRAL performances enable aerial trips: this is easier and faster than transport road on a trailer, although this is possible.
Shipping in crate or container abroad requires dismantling of various parts of the MISTRAL: landing gear, propeller, tail unit, cabane. Re-mounting of the these parts is explained in a special note.

F.1.1. Assembling

Your MISTRAL is made of 15 different parts:
- 1 fuselage
- 4 wings
- 2 horizontal half tail units
- 2 struts
- 2 interplane struts
- 2 jury struts
- 1 upper root fairing for upper wing (laminate)
- 1 lower root fairing for upper wing (transparent polycarbonate)

Assembling your MISTRAL requires 30 to 60 minutes by 2 persons. Stay away from the wind, which would complicate the operation.

Needed tools: spanners nb. 7, 10, 13, 17, 19 mm - 2 of each type.

Assembling procedure:

a) Assemble the two main struts: Position the ball joint end in the strut root housing, with the rounded part of the strut frontwards. Put the screws and the corresponding nylstop nuts (M10). Pass the pitot tube in the holes.

b) Assemble the upper wings: Mount a wing completely before mounting
the next one. The upper wings are recognizable thanks to the absence of antitab on the trailing edge. Take the upper wing root, an assistant lifting the tip. Insert the ball joint ends in the corresponding housings of the cabane and wing. Put the screws and corresponding nylstop nuts (front: M12 - rear: M8). Lift the wing tip and fit the strut (M8 x 60 nut). Tighten all the nuts (N.B.: use only brand-new nylstops !). Carry out the same for the other wing.

c) Assemble the interplane struts: Insert the strut aluminium end bearing in its housing (next to the connection strut-upper wing). Attach the strut (rounded part frontwards !) with a M8 x 60 nut, in accordance to drawing 1. Slightly tighten the nut, being sure that the interplane strut, hung to the upper wing, may still slightly be moved frontwards - rearwards.

d) Assemble the lower wings: Take a lower wing root, an assistant lifting the tip. Insert the ball joint ends in their corresponding housings. Fit the M10 nut through the spar ball joint end, and the M8 attachment nut on the roll control, then the M6 attachment nut on the interplane strut. Tighten all the nuts.

Note:
- the M8 fixing screw of roll controll must be mounted imperatively with the head towards the rear part of the aircraft.
- When mounting the wing, once the spar ball joint end is inserted, take care not to make the wing pivot over its travel in incidence.

e) Install the upper root fairing: Place the fairing and attach it with "Parker" screws. Finish the fitting with white adhesive tape (Ref. AS 471) on the wing-fairing junction.

f) Connect the antitabs: Break the plastic lock of the ball joint end and insert it in the corresponding housing in the fuselage. Lock the ball joint end. Do not mix the 2 drive rods: their different lengths were adjusted during your MISTRAL test flight.

g) Assemble the tail unit: Mount the right half tail unit: insert the aluminium spar in the steel root, by passing the fitting arm in the root rib hole. Turn the trailing edge downwards to let the blocking screw stick out of the rib. Tighten the blocking butterfly, do not forget the safety pin. Carry out the same for the left half tail unit. Place the trim control wheel in maximum "nose-down" position. Before inserting the locking screw, turn the tail unit in "nose-up" position, in order to insert the anti-balance tab arm in the sliding bearing. Then, block the tail unit (locking screw + butterfly + pin).

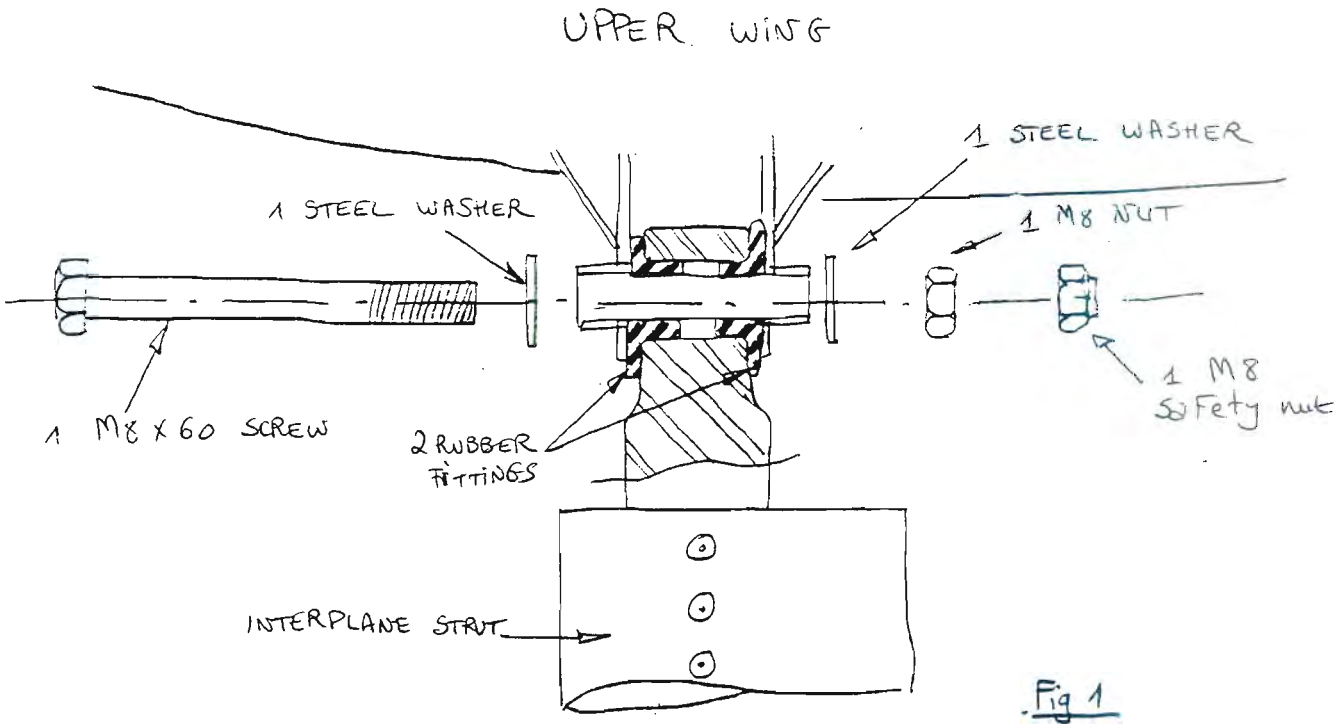


Fig 1

YOUR MISTRAL IS ASSEMBLED

F.1.2. Dismantling:
Carry out the mounting procedure in the reverse order. When you dismantle the attachment part between the lower wing interplane strut, see that the strut lower tip does not damage the upper surface by pivoting towards the center. Replace all the connecting parts (axles, pins, nuts) on the corresponding elements.

F.2. ADJUSTMENTS

F.2.1. Engine: NEVER MODIFY THE ENGINE ADJUSTMENT WITHOUT CONSULTING A QUALIFIED TECHNICIAN. Seek advice in the engine manual.

F.2.2. Seats: the seats length is adjustable by the front holding strap.

F.2.3. Cable operated brakes: the ajustment is done at the cable end, near the wheel. Apply on the adjustable cable stop until the shoes slightly rub on the discs.

F.2.4. Aerodynamic adjustments:
Your MISTRAL was adjusted in the factory. Given the mounting tolerances, it might need a more precise adjustment. These adjustments are done through the rudder trim tab and the lower wings anti-balance tab arm.
Procede out as follows:
- Check that the bank indicator is centered when your MISTRAL is perfectly horizontal.
- Fly in still air with a passenger and approximately 25 l of fuel. Trimed in level flight at 105 km/h, keep the bank indicator exactly in the center with rudder and stick.
- Without moving the stick, remove your feet from the pedals. If the bank indicator moves to one side, fold the rudder trim tab to the opposite (i.e., left of a bank indicator on the right). If the bank indicator does not move, the rudder adjustment is correct.
- Then, center again the bank indicator (rudder and stick) and release the stick. If the aircraft turns to one side (for example to the right):
  - shorten the antitab drive rod to the opposite side (left),
  - if this drive rod touches the 2 end bearings, lengthen the drive rod of the same side (right).

* To adjust on the antitab drive rod:
  - unlock the upper end bearings and remove it,
  - screw or unscrew the end bearings, according to what is needed.

  Beware: the length of the screwed part of the rod may never be less than 6 mm.

Carry out these operations again until your MISTRAL is perfectly balanced.

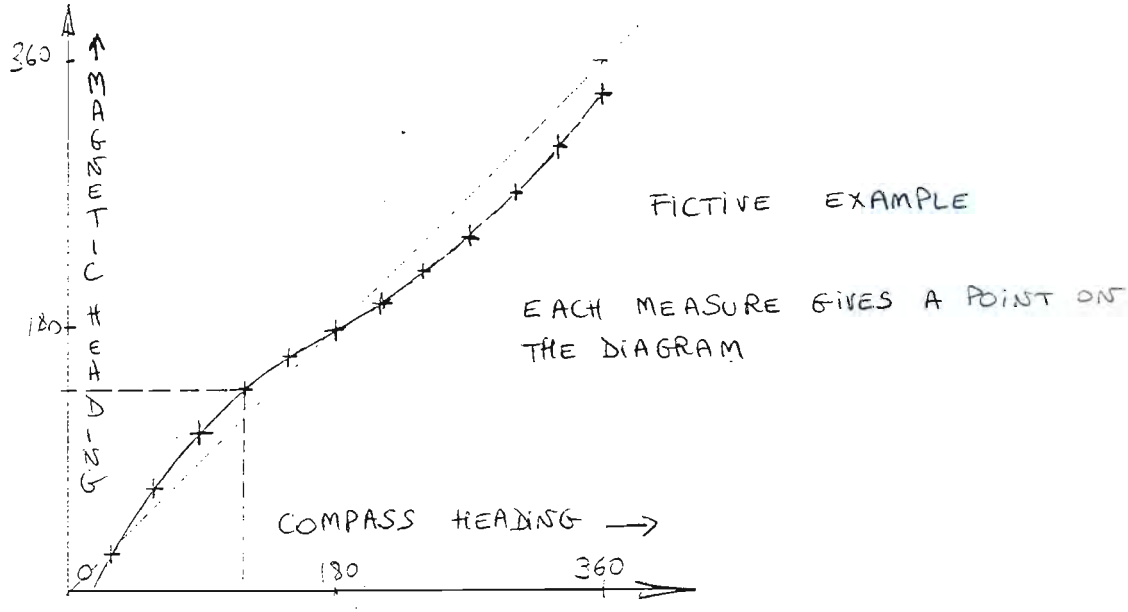
F.2.5. Compass calibration

The MISTRAL compass is located as far as possible from the disruptive sources (engine, electric instruments), but still readable.

The compass is not calibrated when delivering your MISTRAL. You can do this easily.

On the ground, engine running, indicate 360 deg. (N). An assistant, standing 20 m backwards, aim at the aircraft axle with a marine compass (borrow one from a friend sailor), and notes its aim. The operation is repeated for 030 deg., 060 deg., etc...

Then a correction chart may be done.



Example: here is a compass calibration of MISTRAL nb. 6, with values summarized:

Magnetic heading	Read heading	Magnetic heading	Read heading
N	355	S	190
030	035	210	216
060	072	240	240
E	107	W	270
120	138	300	290
150	163	330	320

G) OPTIONS AND SPECIFIC USES

G.1. List of options

- R.S.S. parachute
- (advertizing banners, gliders) towing equipment,
- floats,
- skis,
- 3 bladed propeller,
- enclosed canopy.

G.2. Limitations

G.2.1. Parachute: its weight is part of the useful weight.
See Chapter A.2.3.

G.2.2. Towing:

- all the towing operations must be done with one pilot only,
- the pilot must have a preliminary experience in towing, or an appropriate training.

H) OPERATION

H.1. PREFLIGHT CHECK

Start by the aircraft nose and turn around while inspecting all the elements. Start by the right hand side.

H.1.1. First flight of the day

- Under the cowling:
  - electric wires, connections, etc...
  - fuel system
  - inlet and exhaust manifolds, engine support
  - water cooling system (pipes and level)
  - oil level in rotary valve oil tank

  Close the cowling carefully. Place all the Dzus, starting by the upper part, before locking them.
- Propeller: check it well, it is the most important part of your MISTRAL.
- Propeller spinner.
- Radiators.
- Front wheel and landing gear.
- Main landing-gear, brake.
- Lower wing root (axles, nuts, ball joint ends).
- Upper wing root (axles, nuts, ball joint ends).
- Strut (axles, nuts, rivets).
- Leading edges (lower and upper wing surfaces).
- Interplane strut.
- Vertical and horizontal play of the wing tips.
- Wing antitab and control connecting rods.
- Roll control - travel.
- Parachute.
- Stabilizer (attachment - play - leading edge lower/upper surface).
- Trim - antitab stabilizer.
- Rudder control - hinges - cables.

Carry out the same on the other side, plus:

- Check for shears on the plastic tubing coming from the pitot tubes at their exit from the main strut and entry in the cockpit.

Cockpit:

- fuel pipes and level,
- control stick : free travel, play,
- brake control,
- throttle lever,
- rudder pedals,
- safety harness.

H.1.2. Before each flight

- Propeller and spinner.
- Front landing gear.
- Main landing gear.
- Wings and struts fittings.
- Elevator fitting/travel.
- Stabilizer antitab.
- Fuel level.

H.2.1. Engine running

Beware: Before starting the engine, be sure that:
- nobody is near the propeller,
- the way is free in front of the aircraft,
- the pilot and passenger have helmets and safety harnesses,
- brakes are locked.

H.2.1.1. Cold engine
- Press the priming pump (black, in front of the throttle lever) until it becomes hard.
- Apply full throttle.
- Press the primer bulb (orange, under the instrument panel) once to 5 times according to the temperature (once in case of warm weather).
- Redyce throttle.
- Shout "Nobody ahead".
- Switch on.
- Pull the recoil starter handle vigorously (with both hands), after switching a pawl.
- The engine must start after 5 or 10 pulls. If it is cold, as soon as the engine runs, press again once or twice on the (orange) priming bulb.
- Or, if your MISTRAL is fitted with the electric starter, press the starter switch.

H.2.1.2. Warm engine:
- Low throttle.
- "Nobody ahead".
- Ignition.
- Pull the recoil starter handle vigorously (with both hands), after switching a pawl.
- Or, if your MISTRAL is fitted with the electric starter, press the starter switch.
- The engine must start after 2 to 3 pulls. If not, use the "cold engine" procedure.

H.2.1.3. Incidents:
a) Flooded engine: rare case, but which may occur if you put the starter on a warm engine by mistake:
- FULL throttle, ignition.
- "Nobody ahead".
- Pull the recoil starter handle until the engine coughs, then starts.
- As soon as it runs, block the brakes and reduce throttle progressively.
b) Other incidents: see engine manual: check the spark plugs, ignition, fuel system, in this order.

H.2. FLIGHT

Note: minimum pilot competence:
- Basic airplane licence, or equivalent, and solo flight.
- Ultralight licence + additional training according to the pilot experience.

H.2.2. Taxi:
Test the brakes. Run slowly and try not to suck little stones, grass, ..., in the propeller.

H.2.3. Take-off:
Minimum runway distance: 250 m, or more in case of obstacles.
Before lining up:
- check that the temperature is at least 50 deg. C.
- run up with brake at 5000 RPM at least, until the temperature reaches 60 deg. C.
- DO YOU HAVE ENOUGH FUEL ?
- trim in nose up position, but not completely !
- check controls, OK pilot and passenger
- line up

* Take-off:
- Apply full throttle progressively, by controlling the axle (beware: sensitive rudder pedals). Stick rearwards.
- Take-off at approx. 65 km/h. Level flight until 85 km/h, then climb.
- Reduce between 50 and 100 m at 5800 RPM. KEEP AN EYE ON TEMPERATURE !
- If the climb is long and the weather is hot, a higher speed (100 km/h) improves the cooling.

H.2.4. Landing:
- Approach: 90 km/h.
- Final : 80-85 km/h.
- Avoid too long periods of complete low throttle.
- DO NOT COUNT ON THE BRAKES TO STOP ! Choose a runway long enough !

H.2.5. Optimal approach speed for landing on very short fields:

$V_{approach}$ = 1,3 x V_{MINI} + half wind speed + (gust speed - wind speed)

V_{MINI} = 55 km/h in solo flight,
60 km/h at gross weight.

Example: 370 kg, wind: 25 km/h, gusts at 35 km/h

$$V = 60 \times 1,3 + \frac{25}{2} + (35 - 25) = 100 \text{ km/h}$$

PART TWO

MAINTENANCE MANUAL

K) PERIODICAL CHECKS

K.1. AIRFRAME

Your MISTRAL is designed and built to last; as the structure main parts are made of composite, the airframe maintenance operations are very few.
All the aircraft metal parts are protected against corrosion. Your MISTRAL can be left outside without problem. However, we advise you to shelter it from the wind and bad weather conditions, in a hangar.

1) Every 50 hours or every month:
* Check:
  - rudder cables (sleeve at both ends), grease.
  - throttle cables (sleeve at both ends), oil.
  - brake cable (sleeve at both ends), grease.
  - or brake circuit.
  - rudder hinge components, oil.
  - trim sliding bearing (antitab).
  - tyre pressure.
  - front wheel control.
* Drain the fuel system and tank.

2) Every 100 hours or every 6 months:
Check the brake discs.

3) Every 250 hours or every year:
* Remove: wings and tail units.
* Check: - root ball joint ends (play),
  - wings and interplane struts fitting,
  - stabilizer fitting and articulation,
  - brake control,
  - tyre wear.
* Replace: - throttle cable,
  - fuel priming pump,
  - fuel pipes.

4) Every 500 hours:
* Remove: - wings, tail units, seats, tank, wheels,
  - access hole of elevator articulation.
* Check: - stick articulation,
  - roll and rudder control (play in the end bearings)
  - pedals,
  - wheel bearings.
* Replace: - wing antitab ball joint ends,
  - front wheel control end bearing,
  - brake cables.

5) Every 2000 hours (or every 5 years):
General overhaul (includes removing of wing and tail unit covering).
To do by a qualified technician.

K.2. ENGINE

The engine is the main part of your MISTRAL. It also requires most care and maintenance. Although it is very reliable (we noted that during hundreds of hours of flight, it is not certified "aeronautic" (note that some motorgliders and very light airplaines fly with uncertified engines). Anyway, respect the 2 following orders:
- NEVER take-off with an uncertain engine: the (physical and financial) consequences may turn dramatic.
- ALWAYS fly in gliding reach of a landable field.

1) Every 10 hours
- Remove and clean the spar plugs.
- Check the inlet and exhaust manifolds, oil marks on gear-reduction box, water and oil levels, engine and exhaust rubber mounts, electric wires (see pre-flight check).
- After the first 10 hours, change oil in gear-reduction box.

2) Every 20 hours
- Replace spark plugs.
- Check the state of the recoil starter pulley.

3) Every 50 hours
- Check propeller balance.
- Change oil of gear-reduction box.
- Inspect piston heads by removing inlet manifold. If necessary, decarbonize the combustion chamber (cylinder - piston head).
- Check exhaust manifold springs and fitting hooks.
- Drain carburettor bowl.
- Control all pipes, jubilee clips and electric wires.
- Clean air filter.
- Check the ignition advance adjustment (contact points) after the first 50 hours.

4) Every 100 hours
- Change the contact points - adjust ignition.
- Clean the carburettor jets.

5) Every 250 hours
- Replace cooling liquid.
- Change the carburettor (rubber) inlet manifold.
- Remove and open the gear-reduction box. Check bearings.
- Replace the spring - washers by new ones.
- Remove and open the engine.
- Decarbonize the combustion chamber.
- Hone the cylinders.
- Replace the rings.
- Replace the connecting rod bearings (in piston).
- Control play of bearings (on crankshaft).
- Replace the gaskets.
- If your MISTRAL flies less than 250 hours a year, replace the engine mount and exhaust rubber mounts every year.

6) Every 500 hours

- Send the complete engine to Aviasud Engineering for general overhaul.

Propeller:

- Never fly with a damaged or unbalanced propeller.
- On the ground, put the propeller horizontally.

M) OPERATIONS ON THE ENGINE

M.1. PROP BALANCING

a) To remove the prop
- Unscrew the spinner M4 fitting nuts.
- Unscrew the blocking lock nut of propeller nut.
- Unscrew the propeller bolts.
- Remove the propeller with spinner support.

* To balance the prop
For the life duration of the gear-reduction box, it is absolutely essential that your propeller is perfectly balanced. Insert the balancing bearing by the propeller front part and hang it in a room sheltered from the wind. Observe its position: it must be horizontal. If not (longitudinal and/or transversal incline), carry out as follows:
- Longitudinal balance:
Make heavy the lighter blade with spray paint (beware: wait for the solvant evaporation before controlling !). If this is not enough (in case of repair, for example), it is possible to ballast the blade tip: make a 6...8 mm blind hole in the blade lower surface, at approximately 10 cm from the tip. Put some hunting lead (shot) with Araldite glue; sand and paint after glue hardening.
- Lateral balance:
Use 4 mm washers, fixed with M4 nuts located on a diameter perpendicular to the blade axis, on the spinner support.

b) To remounte the prop
- Mount the propeller and spinner shaft on the gear-reduction box. M8 screws and nylstop nuts in the gear-redcution box at the torque of 1,2 daN.m. (alternative tightening "in cross".
- Control that the blades turn in the same plane:
  a) position a blade in front of a fixed figure. Turn the propeller 1/2 turn by hand (if needed, remove the spark plugs to facilitate the operation), without moving the MISTRAL.
  b) check that the second blade pass at less than 3 mm from the indicator figure.

  c) if not, tighten the screws on the other blade side.
- Mount the spinner, introduce it in the blades, and check that the spinner and the shaft holes meet exactly. If not, turn the spinner of 180 deg. M4 screws + nylstop.

M.2. REMOVING OF ENGINE AND ITS ACCESSORIES

a) To remove propeller (see "Propeller balancing").

b) To remove the exhaust pipe
- Remove the exhaust manifold (jubilee clips).
- Untighten the M8 fixing nuts on the silencer engine mounts (without removing them).
- Remove the holding spring on the exhaust manifold.
- Remove the exhaust pipe sideways by rolling it.

c) To remove the engine
- Wedge the MISTRAL thanks to a support under the tailskid.
- Unplug the spark plug caps.
- Remove the propeller and exhaust pipe (see before).
- Drain the cooling liquid circuit:
  - Place a basin (3 l minimum) under the radiators
  - Undo the 2 radiators pipes. Let the cooling liquid drain.
- Undo the fuel pipes from the fuel pump.
- Untighten the carburettor fixing clip from the rubber manifold, and put the carburettor on the engine bulkhead.
- Unplug the electric connecting multipolar pin.
- Make a safety knot on the recoil starter pulley and pass the pulley through the engine bulkhead.
- If necessary, remove the exhaust temperature sender from the exhaust manifold.
- Untighten the engine fixing screws from the aluminium cross beam (spanner nb. 17 mm), without removing them.
- Hold the engine by its front part and remove the M8 nut and the blocking washer of the upper stay (at the engine mount level).
- Completely remove the 2 lower fixing screws and remove the engine by the front part, without damaging the upper stay.
- Put the engine with the cylinder upwards on a bench.

d) To refit the engine
No particular problem: carry out the operation in the reverse order. Refill with cooling liquid completely (summer: distilled water + AR 101 anticorrosion additive - winter: AG 200 antifreeze mixture) by the filling cap, by opening the drain screw on the water manifold - cylinder. When the water gets out of the drain orifice, retighten the screw by coating it with joint paste.

e) Fuel circuit drain
To do every 3 months
When the air humidity condensates, water appears in the fuel tank; the fuel nozzle being lightly heightened, water (denser than fuel) accumulates in the tank bottom, from which it must be drained regularly:
- Undo the fuel pipe-tap/pump under the cowling.
- Lenghten this pipe with another one and a join (approximately 1 m).
- Insert the tip in a jerrican, and siphon the tank (use the priming pump).
- When the tank is empty, put a bowl (approx. 25 cl) under the tank.
- Undo the sealed pipe part (1) and drain the water-fuel mixture in the bowl.
- Refit the pipe.
- Refit the fuel pipe on the fuel pump.
- Reput fuel in the tank.
- Reprime the circuit using the priming pump.

f) Water circuit drain

- Place a basin (min. 3 l) under the radiators
- Unfaster the water cooling pipes from the radiators.
- Open the circuit drain screw (located on the cylinder manifold). The liquid drains by the cowling low part.
- In most cases, it is not necessary to drain the radiators. To do so, you must remove the radiators:
  - remove the internal cowling,
  - remove the radiator upper frame M7323,
  - unscrew the fixing nuts from the frame and remove the radiators upwards.

To refill the cooling circuit completely:

- Use: - in summer: distilled water + AR 101 anticorrosion.
  - in winter: AG 200 antifreeze mixture.
- Reput the pipes on the radiators.
- Refill by the expansion bottle filling cap.
- When the liquid overflows by the drain screw, retighten the screw by coating it with joint paste.
- Lock the expansion bottle cap.
- Have the engine run, then check the waterproofness of all the joints and the level in the expansion bottle (cold engine: level at more than 3 cm above the transparent tubular tank base).