

MANUALE DI VOLO AUTOGIRO MAGNI GYRO **M - 16 TANDEM TRAINER**



FLIGHT MANUAL MAGNI GYRO GYROPLANE **M - 16 TANDEM TRAINER**

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PILOTS HANDBOOK FOR THE MAGNI M16 /M16C

Registration Marks: _____

Constructors Serial Number: _____

Engine Serial Number: _____

Aircraft Designed and constructed by: Magni Gyro Srl

Pilot's handbook prepared and issued by: Magni Gyro Srl

This gyroplane shall at all times be operated in accordance with this manual.



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GENERAL

It is the responsibility of the pilot to be familiar with the content of this handbook, including any amendments.

Units of measure

The following units are used in this Handbook and where appropriate on the instruments and placards.

Weight	Kilograms
Length (aircraft geometry)	Millimetres
Distance (aircraft performance)	Feet
Altitude	Feet
Airspeed	Knots (Kn)
Moments	Kilogram meters (kgm)
Pressures	Bars (bar)
Temperatures	Degrees Celsius (C)
Liquid Quantities	Litres (l)

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RECORD OF AMENDMENTS

This page 4 and subsequent amendment pages 4/1 etc, will be reissued as necessary with each amendment list.

It is the responsibility of the owner to insure that the amendments are incorporated in the Pilot's Handbook.

Amendment N° and date	Description of Amendment	Pages Affected

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SECTION 1

1 INTRODUCTION

1.1 OBJECT

The present manual is intended to give all the necessary information, which the operator flying the **M-16 and M-16C TANDEM TRAINER** gyroplanes must comply with in order to satisfy the safety and efficiency requirements.

The instructions provide the pilot with a general knowledge of the gyroplane and of its features, as well as with a specific knowledge of the normal and emergency operation procedures.

The manual is aimed at experienced pilots and is therefore devoid of any basic flight principle. It does not substitute a practical training course conducted by a QUALIFIED INSTRUCTOR.

Last, the manual provides the pilot with all the possible procedures necessary to adapt to any circumstance such as multiple emergencies, adverse meteorological conditions, etc.

1.2 PERMITTED OPERATIONS

The manual gives an approach to all the allowed manoeuvres and operations.

WARNING DANGER:



Unless otherwise specified, unusual manoeuvre, operations and configurations are strictly forbidden.

All the procedures which are either not discussed or have not been specifically defined as not allowed are to be considered as allowed.

1.3 LAY-OUT

The manual is divided into 6 sections in order to be more easy to read.
Each section is dedicated to a different subject related to flight operations.

1.4 CHECKLISTS

The manual contains various indexed procedures, which are described with the necessary clarifications or definitions.

The **checklists** are published as indexed procedures and are not developed further.

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1.5 DEFINITIONS

To ensure a safe functioning of the gyroplane, specific symbols are used in this manual to highlight the importance of particular notions, according to their importance.

The symbols used in this manual are described below:



WARNING DANGER:

Operation, technical and other procedures which, if not followed carefully, may expose the operator to the risk of serious accident or death.



WARNING:

Operation, technical and other procedures which, if not followed carefully, may expose the gyroplane and its equipment to damage.



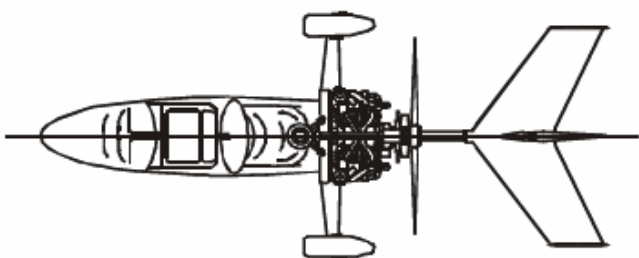
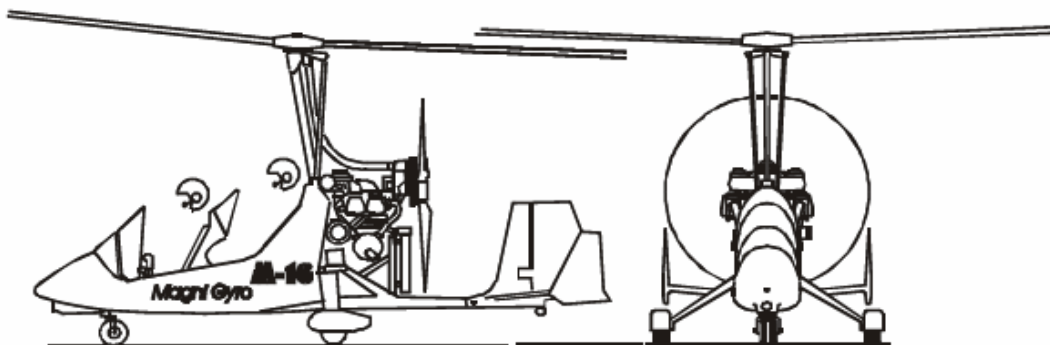
NOTE:

Operation, technical and other procedures which deserve special attention.

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M - 16 C



1.6 PERFORMANCES
(SEE APPENDIX 2 FOR FURTHER DATA)

<i>Maximum speed</i>	87 Kn
<i>Cruising speed</i>	78 Kn
<i>Service ceiling</i>	10000 ft
<i>Takeoff distance to 50 ft</i>	820 ft on grass
<i>Landing distance from 50 ft</i>	510 ft
<i>Rate of climb at MAUW @ ISA</i>	625 ft/min
<i>Tank capacity</i>	69 litres

1.7 DICTIONARY OF TERMS COMMONLY USED IN THE AERONAUTICAL SECTOR

CHT	CYLINDER HEAD TEMPERATURE
EGT	EXHAUST GAS TEMPERATURE
FLYDAT	ROTAX DIGITAL ENGINE INSTRUMENTATION DISPLAY
g	GRAVITATIONAL ACCELERATION
G	GRAVITATIONAL CONSTANT
GA	GLIDE ANGLE
GPS	GLOBAL POSITIONING SYSTEM
kn	KNOTS (kts)
IAS	INDICATED AIRSPEED
LEXAN	SCREEN MATERIAL
MAP	ENGINE MANIFOLD PRESSURE
millibar (mbar)	ATMOSPHERIC PRESSURE MEASUREMENT UNIT
VMC	VISUAL METEOROLOGICAL CONDITIONS



NOTE:

*The manual is written in ITALIAN, the official language of the Manufacturer.
The ENGLISH translation is meant to help foreign operators and has no legal value.*

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SECTION 2

2 GENERAL DESCRIPTION AND INSTRUCTIONS FOR USE

2.1 THE GYROPLANE

The **M-16 and M-16C Tandem Trainer** are single-engine two-seat gyroplanes with a primary structure made of steel and a semi-fairing made of fibreglass plastic reinforced by incorporated fibreglass.

The gyroplane is equipped with a fixed front tricycle landing gear. The tandem configuration allows for the transportation of two crew members in the semi-fairing fuselage.

The power unit is composed of a piston engine and a pusher three-bladed propeller with ground adjustable pitch.

The tail planes are made of composite material. They consist of a fixed horizontal stabilizer and of three vertical surfaces of which the central one is subdivided in to fin and rudder.

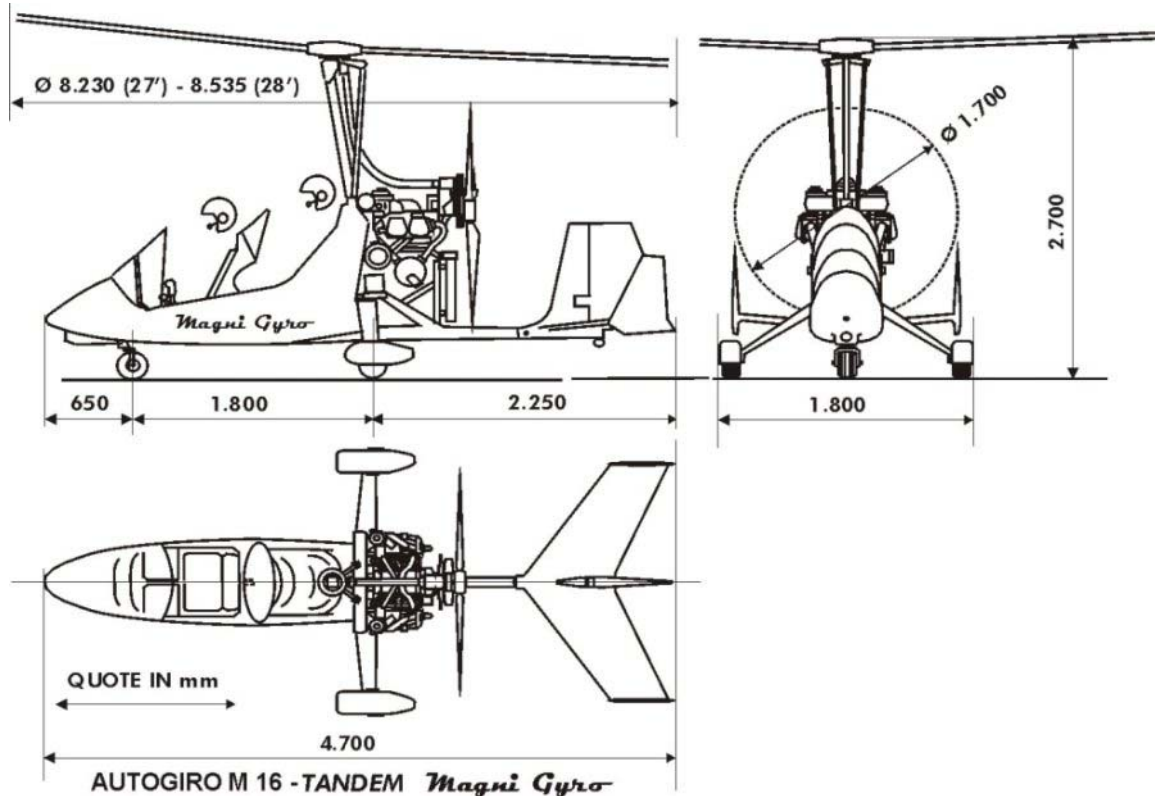
The rotor and main undercarriage are also manufactured from composite materials.

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2.2 OVERALL DIMENSIONS

The overall dimensions are indicated below:

- Rotor diameter 8535 mm (28') or 8230 mm (27')
- Total length 4700 mm
- Width 1800 mm
- Height (without rotor) 2650 mm
- Maximum height (with front bar) 2700 mm



The steering radius is indicated in Figure 3.8/2.

2.3 EMPTY AND TAKEOFF WEIGHT

- Dry weight 278 kg
- Empty weight 285 kg
- Maximum allowed takeoff weight (MTOW) 500 kg – limited to 450 Kg if required by the requirements in force in the country the gyroplane is registered in or operated in.

WARNING DANGER:



The pilot must adjust his load sheet in order to make sure he does not exceed the maximum takeoff weight allowed by the requirements in force in the country he is operating in or in which his gyroplane is registered.

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2.4 GENERAL CONFIGURATION

All the main components of the gyroplane are listed in this chapter.

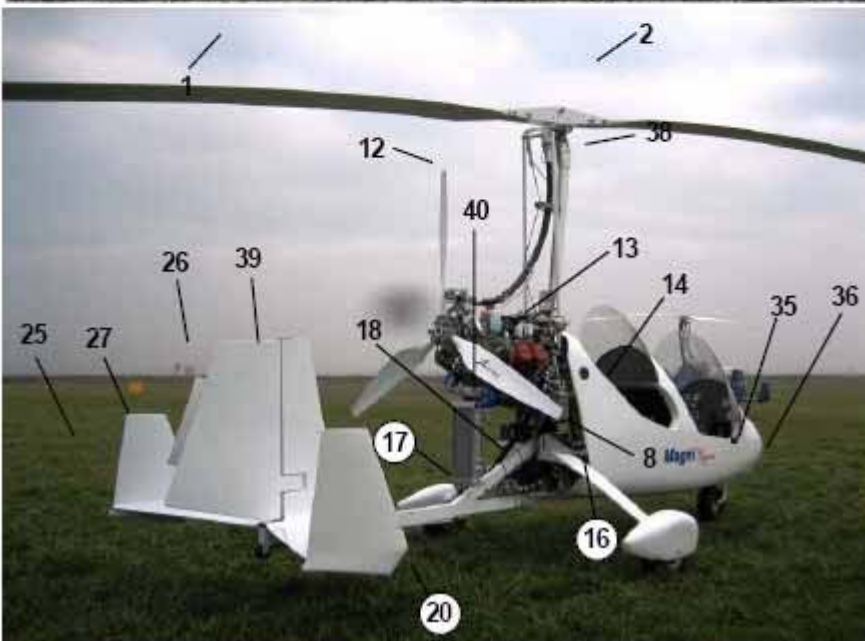
Whenever communicating with MAGNI GYRO (via telephone, e-mail, fax, etc.), pilots and operators should always use the same terminology in order to identify the components safely.

The terms “front” (FR), “rear” (REAR), “right” (RH), “left” (LH), “high” (SUP) and “low” (INF) must be understood as shown in the figure below.



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2.4.1 DESCRIPTION OF MAIN COMPONENTS



- 1 - Rotor
- 2 - Rotor blade hub-bar
- 3 - Rotor head
- 4 - Rotor brake
- 5 - Bendix gear
- 6 - Rotor control rods
- 7 - Trim control unit
- 8 - Trim actuator
- 9 - Fork unit
- 10 - Pre-rotation flexible shaft
- 11 - Pre-rotation unit
- 12 - Ground adjustable pitch three-bladed pusher propeller
- 13 - ROTAX piston engine
- 14 - Fuel tank cap
- 15 - Fuel tank
- 16 - Oil tank
- 17 - Radiator
- 18 - Battery
- 19 - Exhaust manifold
- 20 - Structure
- 21 - Main undercarriage
- 22 - Wheel
- 23 - Front steering wheel
- 24 - Stabilizer
- 25 - Winglet
- 26 - Rudder
- 27 - Trim tab
- 28 - Pilot/passenger cockpit
- 29 - Landing light
- 30 - Dynamic intake
- 31 - Pilot windscreen
- 32 - Pilot seat
- 33 - Passenger windscreen
- 34 - Passenger seat
- 35 - Instrument panel
- 36 - Control stick
- 37 - Rudder pedals
- 38 - Mast upper part
- 39 - Fin
- 40 - Heat exchanger

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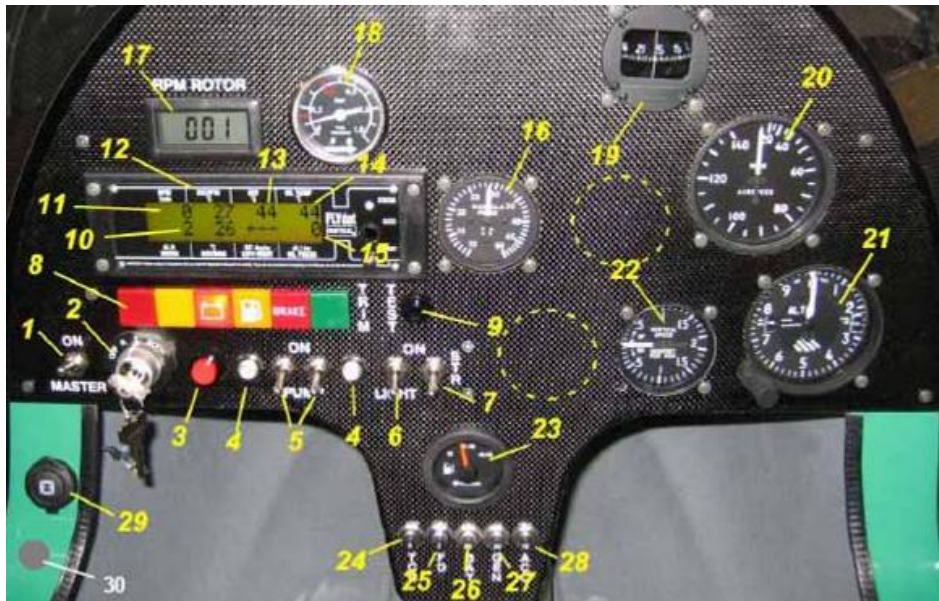
2.4.2 DESCRIPTION OF COCKPIT



- 1 - Instrument panel
- 2 - Engine data digital display
- 3 - Warning lights line
- 4 - Pumps control line
- 5 - Navigation instruments line
- 6 - Circuit breakers line
- 7 - Steering rudder pedals (rudder and nose wheel)
- 8 - Footboard
- 9 - Control stick handle
- 10 - Pre-rotation control lever
- 11 - Auxiliary feed outlet
- 12 - Rotor trim control
- 13 - Brake control lever & Park Brake
- 14 - Throttle lever
- 15 - Choke control lever
- 16 - Front seat
- 17 - Seat belt
- 18 - Windscreen
- 19 - N/A for ROTAX 914
- 20 - N/A for ROTAX 914

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2.4.3 DESCRIPTION OF INSTRUMENT PANEL



1 - MASTER	Master switch
2 -	Ignition key
3 -	Start push button - choke
4 -	5A push button breaker for fuel pumps
5 -	Main and auxiliary pumps switches
6 -	Landing light switch
7 -	Stroboscopic lights switch
8 -	Warning lights line
8 a DANGER	Red - danger of overpressure
8 b WARNING	Yellow - Warning or Caution
8 c BATTERY	Generator not working
8 d RESERVE	Low fuel level
8 e BRAKE	Rotor brake (ON when engaged)
8 f TRIM	Green, trim in end position
9 - TEST	Fuel reserve warning light test push button
10 - 0,1 x hour	Hour meter
11 - Engine r.p.m.	Engine tachometer
12 - EGT	Exhaust gas temperature indicator
13 - CHT	Cylinder head temperature
14 - OIL TEMP	Oil temperature
15 - OIL PRESS	Oil pressure
16 - MAP	Manifold pressure indicator
17 - Rotor r.p.m.	Rotor tachometer
18 - FUEL Press.	Fuel pressure indicator
19 -	Compass
20 - ASI	Air-speed indicator
21 - ALT	Altimeter
22 - VSI	Vertical speed indicator
23 -	Fuel level gauge
24 - TCU	Circuit breaker 5A TCU
25 - FD	Circuit breaker 2A FLYDAT
26 - BATT	Circuit breaker 20A battery
27 - GEN	Circuit breaker 20A generator
28 - ACC	Circuit breaker 10A
29 -	Auxiliary feed outlet
30 -	N/A for Rotax 914

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2.5 ENGINE

The M-16 and M-16C models are fitted with a four-stroke ROTAX 914 engine equipped with four horizontal opposed cylinders, turbocharger and mixed water-air cooling.

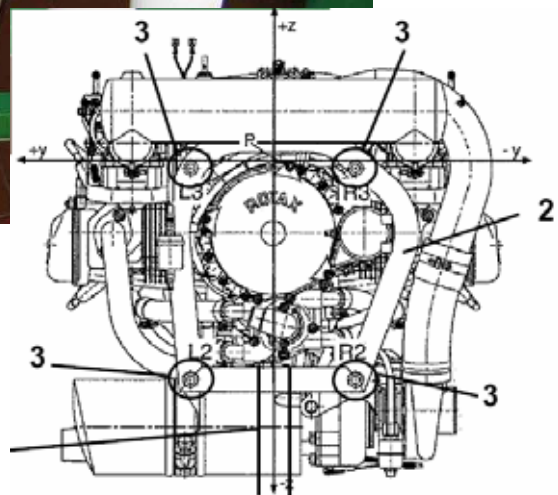
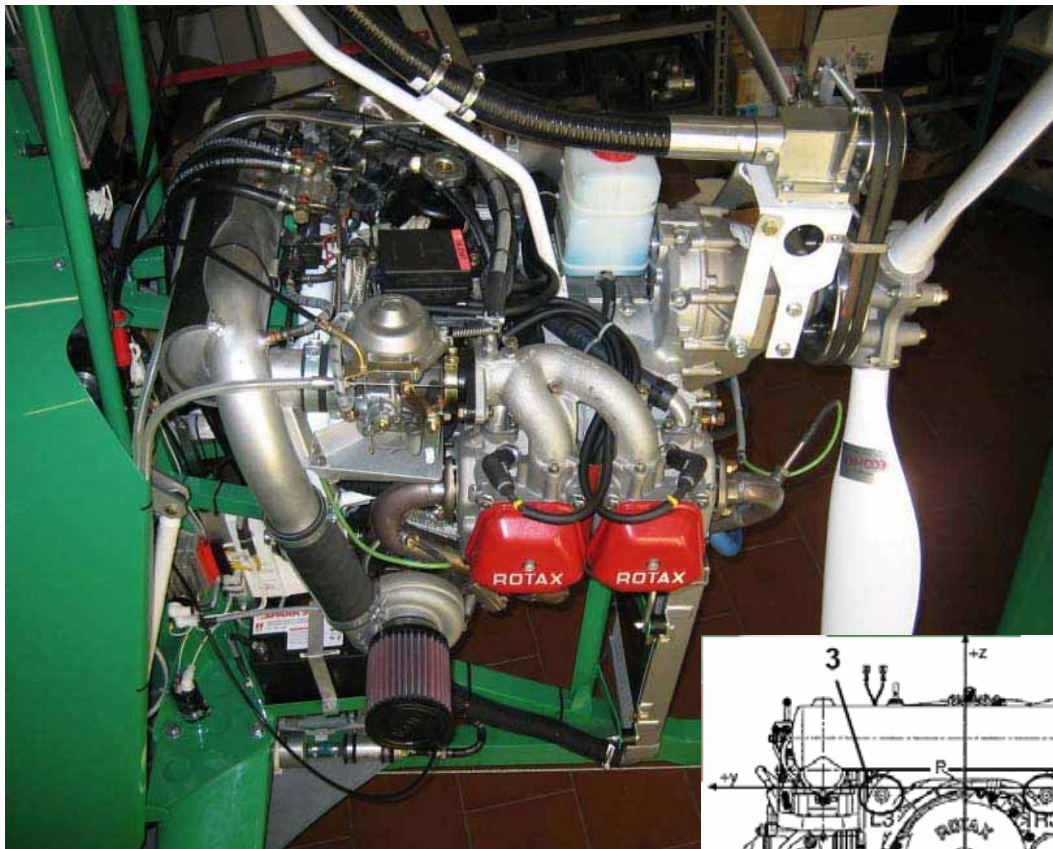
The engine is fixed to the structure (1) through a mounting (2) equipped with suitable vibration damping systems (3), behind the passenger seat, in thrust configuration.

The engine can deliver up to 115 hp at 5800 r.p.m.

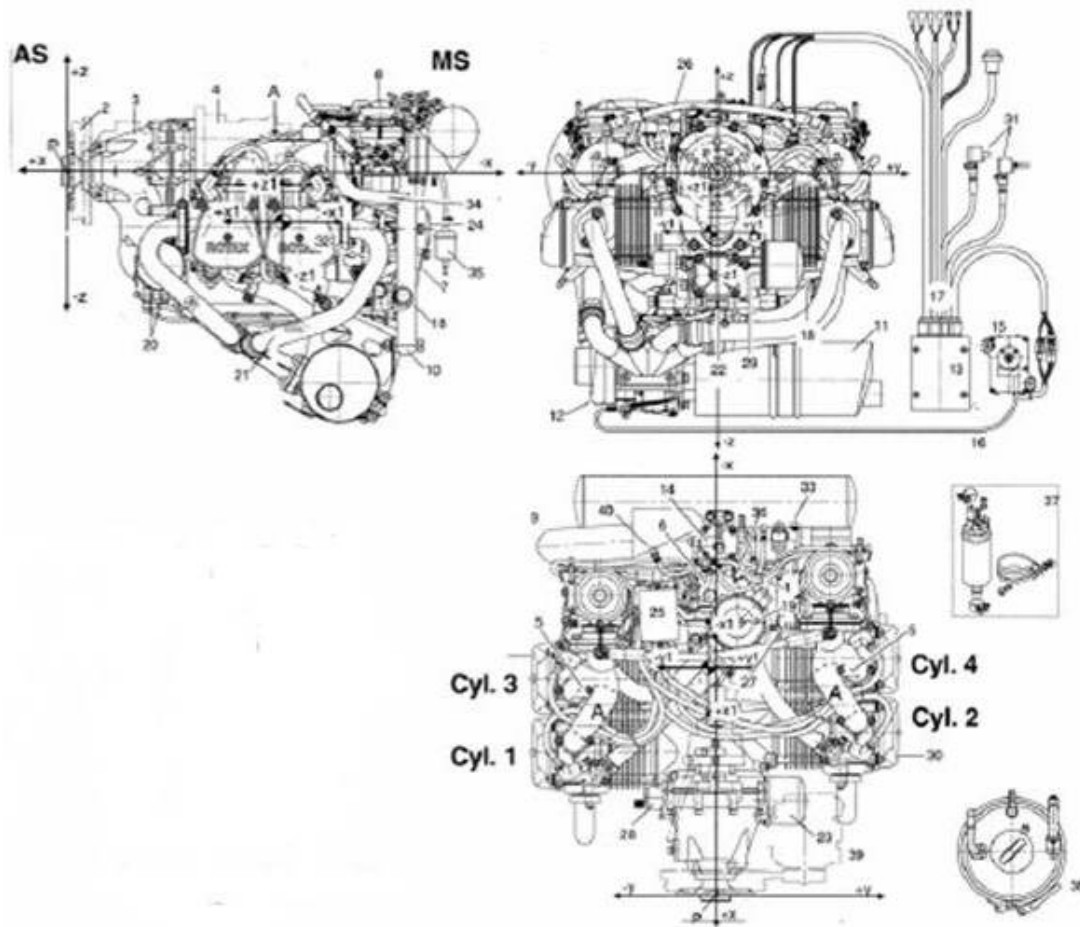
NOTE:



See the separately supplied ROTAX ENGINE MANUAL for more information on all operations concerning engine use and maintenance.



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1 - engine number	11 - stainless steel exhaust system	21 - connection for oil return line (engine)	31 - 2 pressure sensors
2 - propeller flange	12 - turbocharger	22 - connection for oil return line (turbo)	32 - connection for mechanical rev counter
3 - propeller gear	13 - turbo control unit (TCU)	23 - oil filter	33 - connection for additional temperature sensor (airbox)
4 - Vacuum pump or hydraulic governor for constant propeller speed	14 - fuel pressure control	24 - electric starter	34 - drip tray
5 - intake manifold	15 - engine servo	25 - electronic modules for ignition	35 - water trap
6 - ignition housing	16 - servo cable	26 - compensation tube	36 - three-way solenoid valve
7 - ignition cover	17 - cable assembly	27 - connection for manifold pressure	37 - 2x electric fuel pump
8 - constant depression carb	18 - coolant pump	28 - sensor for oil pressure	38 - oil tank
9 - airbox	19 - expansion tank	29 - sensor for oil temperature	39 - external alternator
10 - engine suspension frame	20 - 2 separate oil pumps	30 - sensor for cylinder head temperature	40 - enrichment jet

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2.6 LUBRICATION SYSTEM

The ROTAX 914 engine is fitted with a "dry-crankcase" type lubrication system. The lubricant is contained in a dedicated tank, separated from the engine unit and positioned within the limits allowed by the engine installation manual.

The oil pressure necessary for a correct lubrication of the engine is guaranteed by a pump integrated with the engine. The oil filter is mounted off a flange on the bottom of the engine.

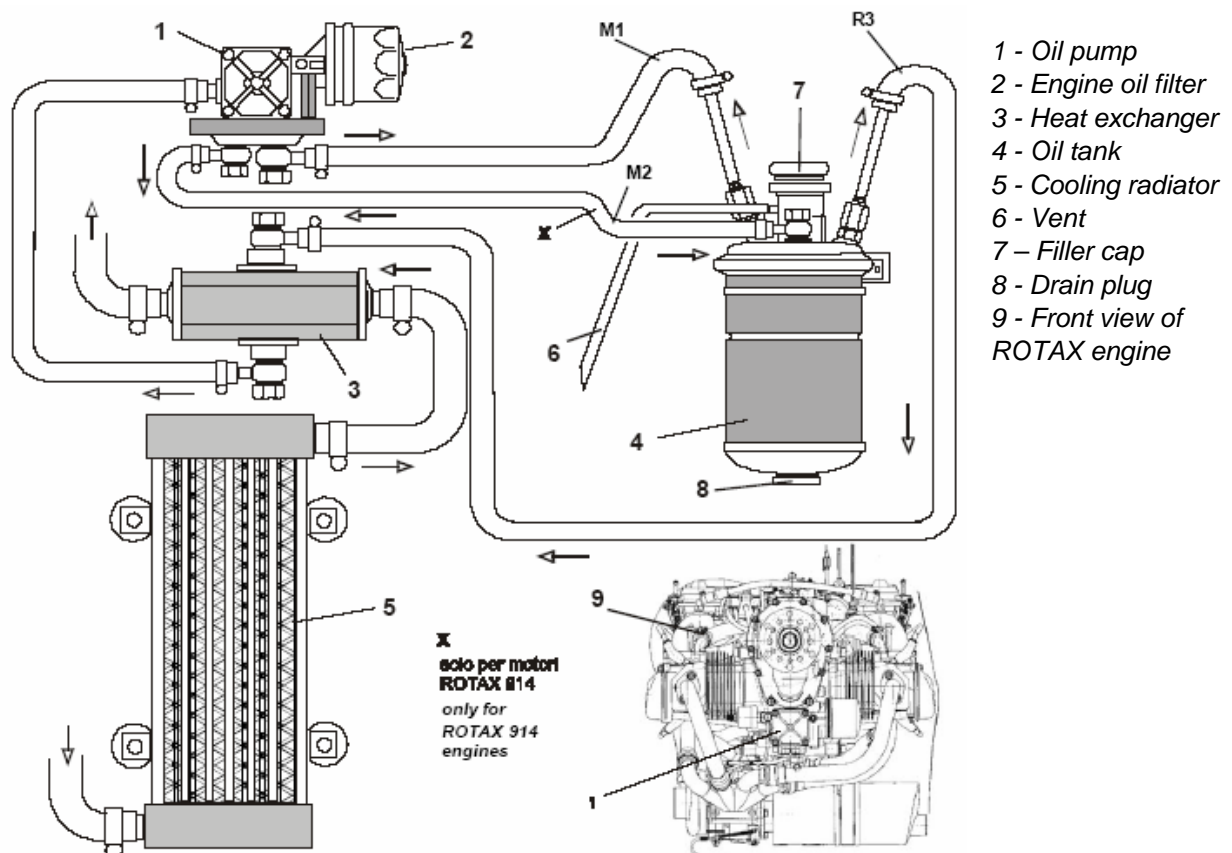
To keep the temperature within the allowed limits, the oil is sucked from the tank and passes through a heat exchanger prior to reaching the engine. The oil coming from the pump is filtered and conveyed to all the engine so as to guarantee the correct lubrication of all its components.

The oil returns to the tank through two distinct lines: one directly from the engine crankcase, the other from the turbine. Furthermore, the oil tank is equipped with a separate vent line.

WARNING DANGER:



The ROTAX 914 engine's lubrication system does not allow a correct engine lubrication in case of inverted flight or of a too heavy negative load. Operators are reminded that such conditions are largely out of the gyroplane's flight envelope, independently from the engine's limitations

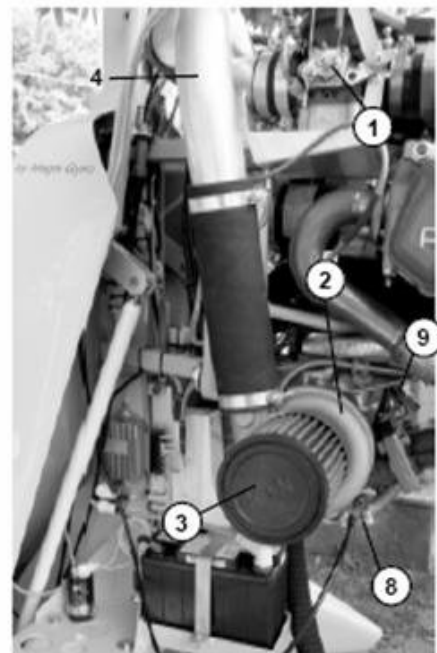
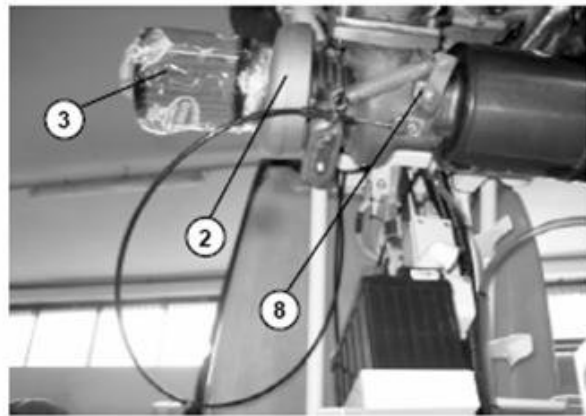
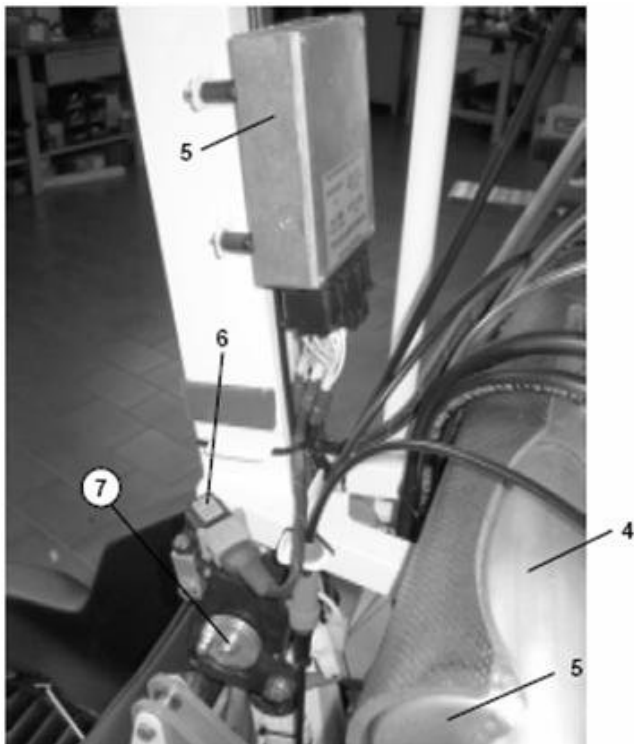


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2.7 INTAKE SYSTEM

The engine is fitted with two carburetors. A turbine placed upstream of the carburetors is driven by the exhaust gases. Through the compressor it can vary the pressure inside the engine's intake duct, thus increasing its performance and limiting the effects of altitude density.

The pressure inside the intake duct varies according to the opening of the throttle lever, monitored by a control box through a dedicated valve (waste gates). The engine's turbocharger is designed in such a way that the carburetors do not need any anti-icing system, as this problem does not exist.



- INTAKE SYSTEM

- 1 - Carburetors
- 2 - Turbine
- 3 - Intake filter
- 4 - Intake duct (AIRBOX)
- 5 - TCU turbo control unit
- 6 - Environment pressure sensor
- 7 - Servomotor
- 8 - Waste gate control lever (controlled by servomotor)
- 9 - Muffler

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2.8 FUEL SYSTEM

The fuel is conveyed to the engine carburettors by two electric pumps, which are fed by two separate electric circuits. See Figure 2.8/1.

2.8.1 MAIN LINE

The fuel system's main line consists of a tank, a fuel filter, two electric pumps, two non-return valves and a pressure regulator. The tank is part of the passenger seat. It has a capacity of 72 litres. Approximately 3 litres of fuel cannot be pumped.

NOTE:



The fuel gauge fitted to the M16 and M16C reads 'FULL' when the content of the tank is over 55 litres. For fuel levels above 55 litres the pilot should verify the tank contents by use of the markings on the rear of the tank.

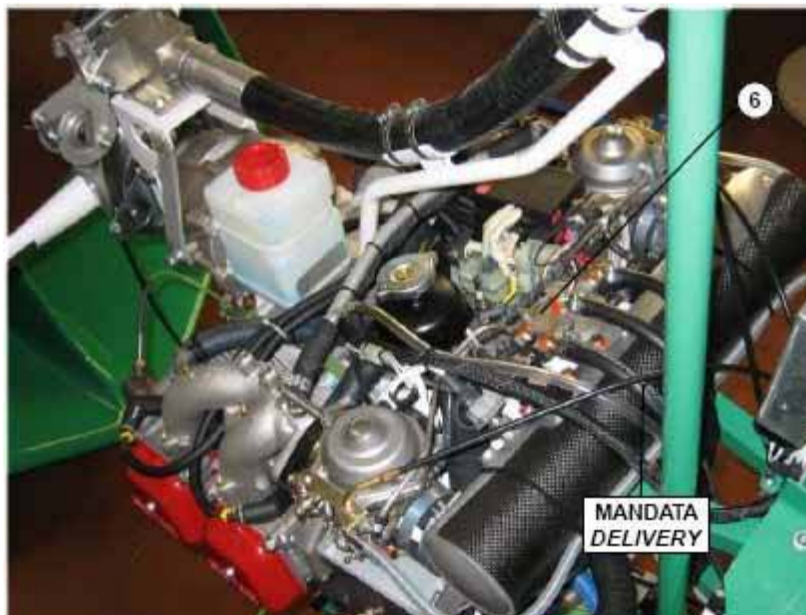
The tank is fitted with a drain valve (located in the tank's lowest point) and with a float-type fuel level gauge (fixed to the rear left wall).

The level gauge's electric circuit is fed with 12 V through the equipment circuit (bus), which is protected by a 10 A circuit breaker. The level gauge's fastening flange also houses the fuel line's pumping and backflow connectors. The fuel is pumped through a stiff pipe located inside the tank, at the end of which a wide-mesh filter is installed. The fuel is filtered by a filter fixed under the main undercarriage, along the structure keel.

Two electric pumps for fuel are assembled in parallel downstream the filter. They are fitted with non-return valves.

The fuel line ends in the pressure regulator (located on the engine) and in the following tank backflow line.

A banjo union is fixed to the pressure regulator. The fuel pressure indicator line is fixed to that banjo union.



- 1 - Fuel tank
- 2 - Filler with cap
- 3 - Level indicator
- 4 - Intake filter
- 5 - Drain valve
- 6 - Pressure regulator (ROTAX)
- 7 - To right carburettor
- 8 - To left carburettor
- 9 - Tank vent pipe
- 10 - Fuel filter
- 11 - Main delivery pump
- 12 - Auxiliary delivery pump
- 13 - Non return valve
- 14 - Mass plate
- 15 - Fuel level indicator
- 16 - Main and auxiliary pump switches
- 17 - Fuel reserve indicator
- 18 - Fuel pressure indicator

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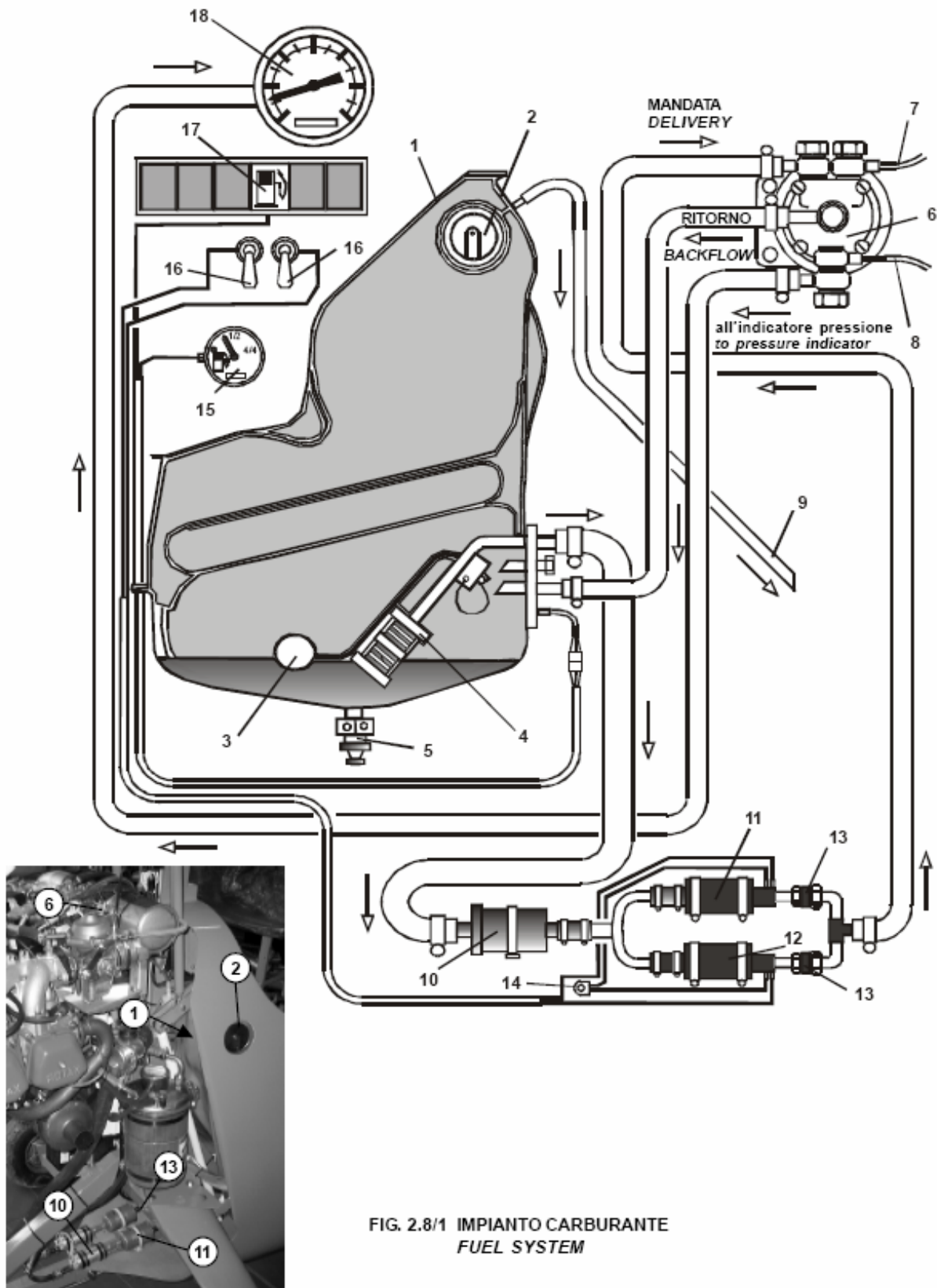


FIG. 2.8/1 IMPIANTO CARBURANTE
FUEL SYSTEM

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2.8.2 FUEL QUANTITY DATA

Maximum capacity of fuel tank 72 litres
Usable fuel quantity 69 litres
Not usable fuel quantity 3 litres

2.9 COOLING SYSTEM

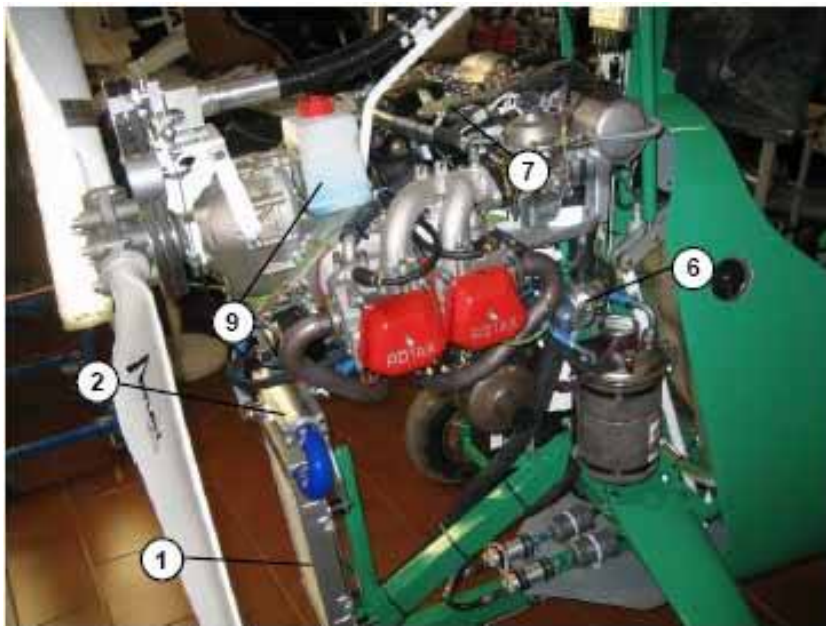
(see fig. 2.9/1)

The engine is equipped with an air-water type cooling system.

The heads of the ROTAX 914 engine are water-cooled by a cooling system equipped with a vacuum pump (connected to the shaft) that sucks the coolant from the radiator. This coolant flows through the heat exchanger, cools the oil and then reaches the engine.

The cylinders of the ROTAX 914 engine are cooled by the air that strikes the engine. As the engine is configured and installed in an area without cowlings, there is no need for air intakes or conveyors of any type.

The combined cooling action of both systems guarantees the correct preservation of the temperatures within the limits indicated in the engine's operators manual.



- 1 - Cooling radiator
- 2 - Heat exchanger
- 3 - Water pump
- 4 - to the LH engine
- 5 - to the RH engine
- 6 - Thermal expansion valve
- 7 - Expansion tank
- 8 - Backflow from engine
- 9 - Expansion tank
- 10 - Expansion tank cap
- 11 - Expansion tank cap
- 12 - Lubrication system line

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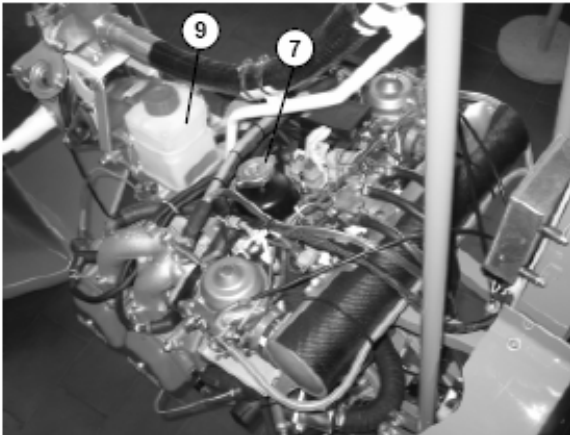
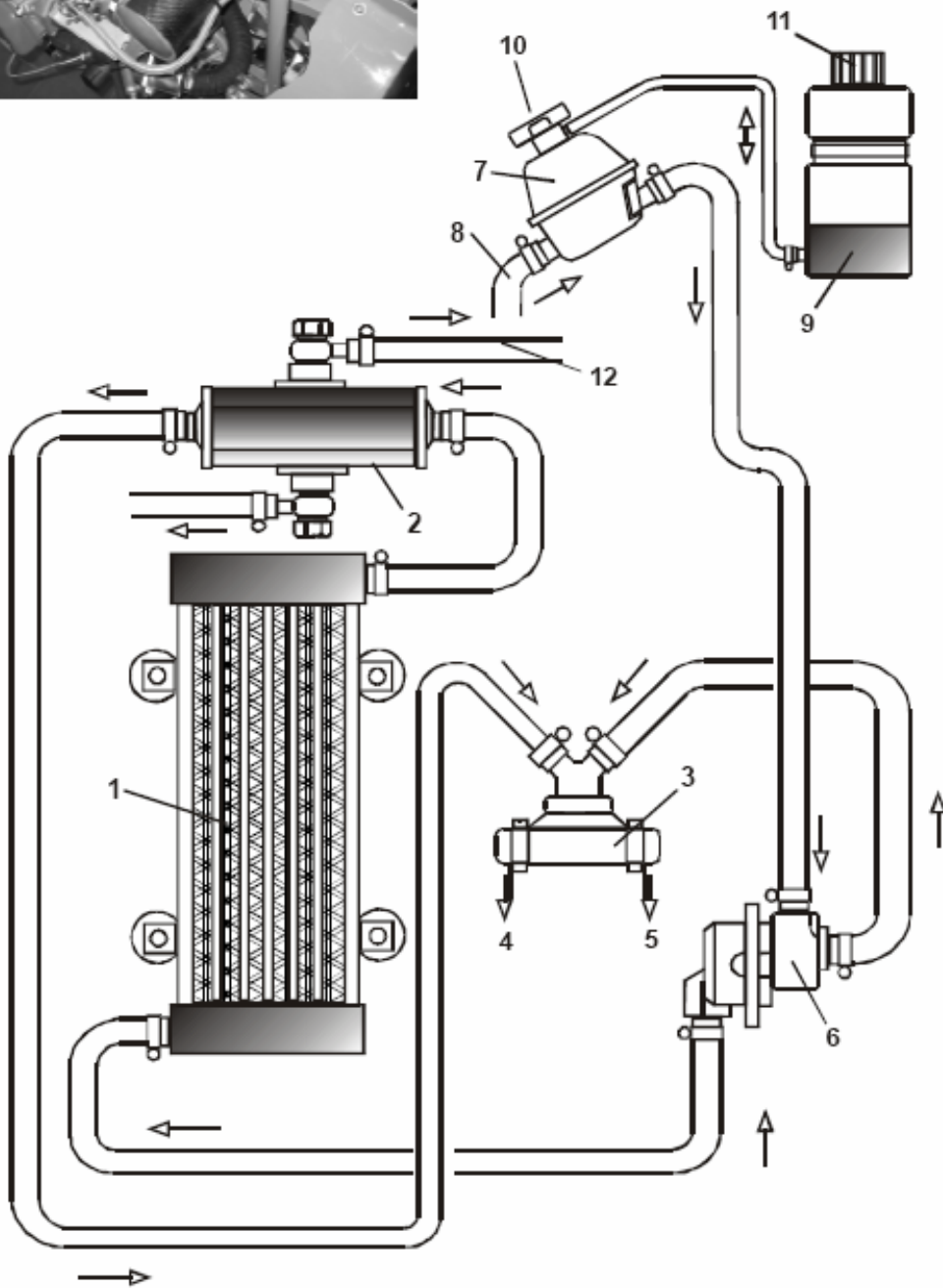


FIG. 2.9/1 IMPIANTO DI RAFFREDDAMENTO
COOLING SYSTEM



2.10 PROPELLER

The gyroplane is fitted with a three-bladed Arplast ECO GL3 ground adjustable pitch propeller.

The standard pitch for the motorization of a ROTAX 914 engine is 12° 45" when measured at the end of the propeller.



WARNING DANGER:

The propeller pitch is set at the factory and should not be altered. Alteration of pitch angle may have a serious adverse effect upon aircraft performance.



Figure 2.10 – Three Bladed Propeller

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2.11 ENGINE CONTROLS

The engine has three main controls:

- Ignition key
- Throttle lever
- Choke lever

But, to use the engine, it is necessary to use all the controls indicated in Fig. 2.11/2: master switch, switches of main and auxiliary pumps, push buttons of fuel pumps, ignition key in its various positions and start push button (starter).



- 1 - Choke lever
- 2 - Throttle lever
- 3 - Ignition key

2.11.1 CHOKE CONTROL LEVER

(see Fig. 2.11.1)

The choke (3) allows to increase the percentage of fuel in the air-gas mixture at low engine r.p.m., so that it is more easy to start in case of low ambient temperature.

To engage the choke, place the lever in vertical position. To disengage it, put it back in low position.



WARNING:

When starting the engine with the help of the choke, the throttle lever must be kept in its idling position (IDLE). Once the engine is started, do not use the choke for extended periods of time. Do not use the choke if the ambient temperature is greater than 20° C.

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2.11.2 THROTTLE LEVER

The throttle lever (1) allows the engine speed (r.p.m.) to be varied and thus to vary the power delivered. Moving the throttle forward opens the carburetors' throttle valve, thus increasing the power delivered. Moving the throttle backward reduces the power delivered.

With the ROTAX 914, the throttle's movement goes from 0 to 115% of maximum continuous power. During the travel from 0 to 100%, the power is delivered proportionally to the movement of the throttle lever, so that it can be modulated. Once it reaches 100%, a stop (2) blocks the lever's forward movement.

To make use of the maximum available power (115%), the pilot must press the lever (1) slightly towards the inside of the cockpit (3) to get beyond the stop and then continue the forward movement.

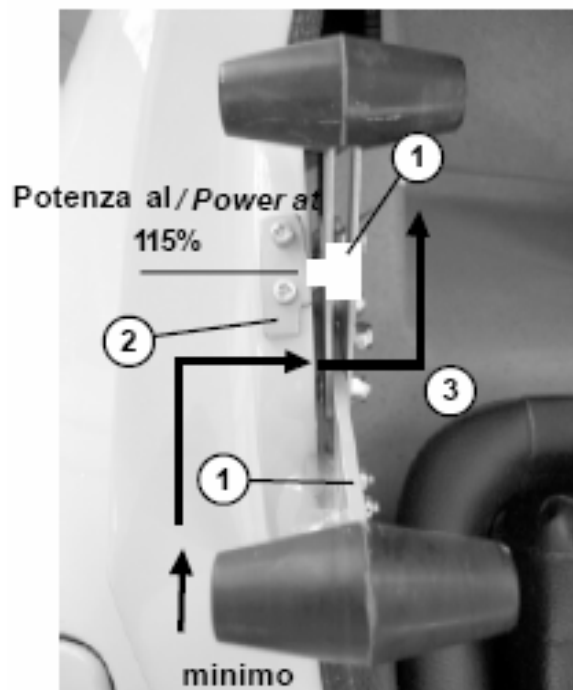
Once the lever moves beyond the 100% stop, the power delivered is not proportional to the movement, as the engine boosting does not take place in a linear manner.

115% power can be used when necessary for takeoff operations, always taking care not to exceed the engine's maximum speed (5800 r.p.m.).

NOTE:

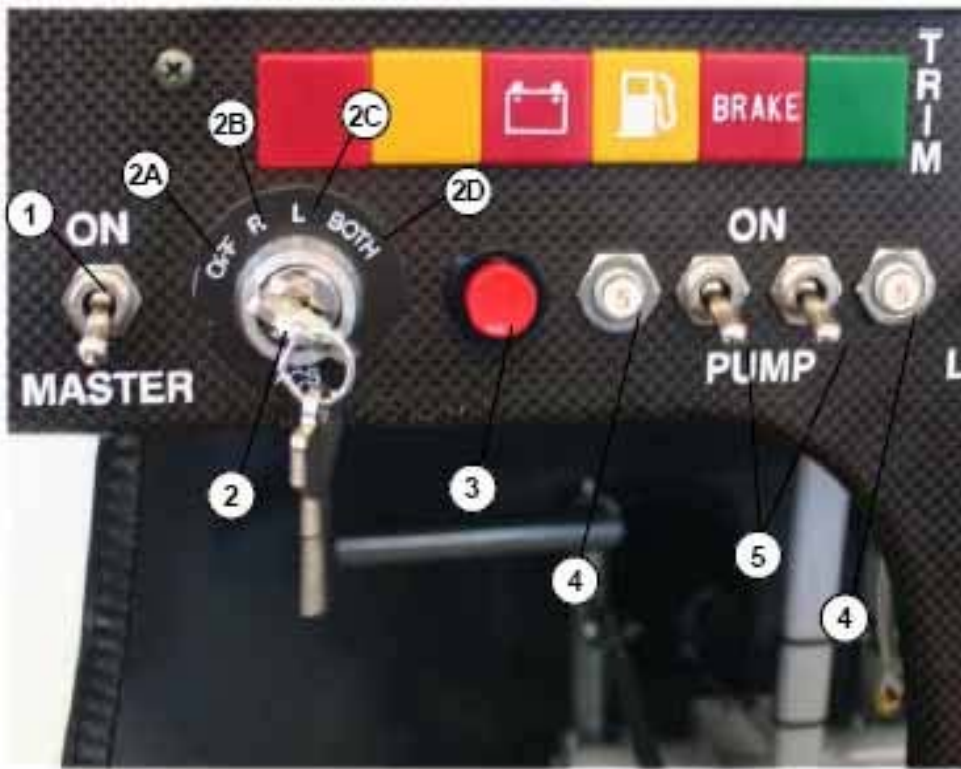


The maximum continuous power for takeoff is given at 100% of the delivered power. The maximum available power (115%) can only be used for not more than 5 minutes. After 5 minutes, the management system of the turbo automatically reduces the delivered power until reaching the maximum value of continuous power (100%).



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2.11.3 IGNITION KEY
(see fig. 2.11/3)



- 1 - Master SWITCH
- 2 - Ignition key
- 2A - OFF: De-energized position
- 2B - R: Right magneto is on
- 2C - L: Left magneto in on
- 2D - BOTH: Both magneto are on
- 3 - Start push button - choke
- 4 - Fuel pumps circuit breakers
- 5 - Main - auxiliary pumps switch

This key allows to open the engine's ignition circuits. It permits to select four positions:

OFF	ignitions not on
R	ignition A on
L	ignition B on
BOTH	both ignitions activated

WARNING:



The flight operations must always be done with the key in BOTH positions, except when doing the ignition test during the pre-takeoff checks.

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2.12 ENGINE INSTRUMENTS

2.12.1 DIGITAL ENGINE MONITORING SYSTEM (FLYDAT)



All the engine's instruments are grouped in the FLYDAT digital instrument supplied by ROTAX.

The FLYDAT instrument is placed on the left side of the instrument panel. It permits to monitor 9 engine operation parameters:

1. engine rpm (revolution per minute)
2. hour counter (0.1 h)
3. exhaust gas temperature EGT/PTO. Arrow (5) to the left (LH rear cylinder); arrow (5) to the right (RH rear cylinder). The EGT reading changes from right to left bank as indicated by the arrow (5). This variation happens every 9 seconds.

“PTO” stands for “POWER TAKE OFF” = rear cylinders, “MAG” stands for “MAGNETO” = front cylinders.

4. exhaust gas temperature EGT/MAG. Arrow (5) to the left (LH front cylinder); arrow (5) to the right (RH front cylinder)
5. direction arrow (points towards RH or LH)
6. memory push button; press to monitor the maximum values reached
7. cylinder temperature CHT (cylinder no. 2)
8. oil temperature
9. oil pressure (0.1 bar).

In the standard configuration, all the temperatures are expressed in °C. FLYDAT also shows:

10. LED
 - if the light is green, indicates that the parameters are regular
 - if the light is red, indicates that the parameters are off limits
11. input or output data connection

For more information on the functions of this instrument, please see the FLYDAT OPERATOR'S MANUAL.

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2.12.2 FUEL PRESSURE INDICATOR

(See fig. 2.12/2)

The fuel pressure monitoring instrument is installed on all ROTAX 914 engines. It surveys the fuel pressure through a throttled pipe coupled to the carburetors supply line.

The instrument's scale goes from 0 to 1 bar.

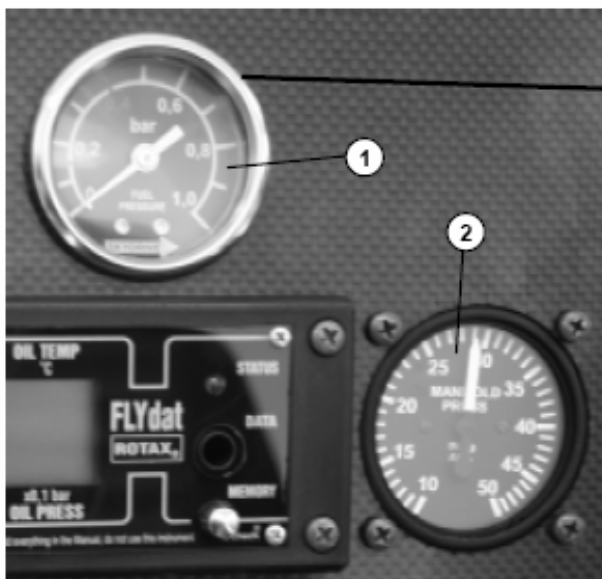
2.12.3 FUEL SUPPLY PRESSURE INDICATOR

(See fig. 2.12/3)

The supply pressure is measured by an instrument placed beside the FLYDAT instrument. The supply pressure is measured (map) through a tube connected to the specially filtered carburetors' balancing pipe.

The instrument's scale goes from 0 to 50 inch/Hg

**FIG. 2.12/2 INDICATORE PRESSIONE CARBURANTE
FUEL PRESSURE INDICATOR**



**FIG. 2.12/3 INDICATORE PRESSIONE DI
ALIMENTAZIONE
FUEL SUPPLY PRESSURE
INDICATOR**

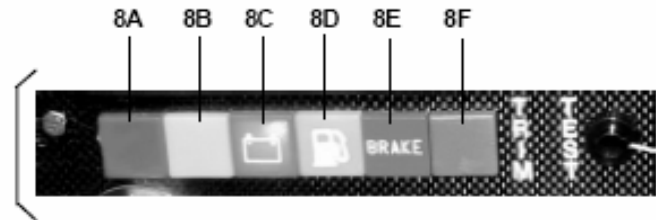
2.13 ELECTRIC INSTALLATION

The installation is fed with a 12 V - 18 Ah battery and is fitted with an auxiliary outlet (OPTIONAL).

The figure below shows all the devices available on the gyroplane. In order to allow a quick identification, the reference numbers indicated in the list are also shown in the wiring diagram.

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**M16 TANDEM TRAINER
FLIGHT MANUAL**



1 - MASTER	Master switch
2 -	Ignition key
3 -	Start push button - STARTER
4 -	BREAKER 5 A push button - fuel pumps
5 - Pumps	Main and auxiliary pumps switches
6 - Light	Landing light switch
7 -	Stroboscopic lights switch
8 -	Warning lights line
8 a DANGER	Red - danger of turbo overpressure
8 b WARNING	Yellow - Engine caution or warning
8 c BATTERY	Generator not working
8 d RESERVE	Low fuel level
8 e BRAKE	Rotor brake (on when engaged)
8 f TRIM	Green, trim in end position
9 - TEST	Reserve warning light test push button
10 - 0,1 x hour	Hour counter
11 - rpm (Engine)	Engine revolution counter
12 - EGT	Exhaust gas temperature indicator
13 - CHT	Cylinder head temperature
14 - OIL TEMP	Oil temperature
15 - OIL PRESS	Oil pressure
17 - rpm (Rotor)	Rotor revolution counter
23 -	Fuel level gauge
24 - TCU	Circuit breaker 5 A TCU
25 - FD	Circuit breaker 2 A FLYDAT
26 - BATT	Circuit breaker 20 A battery
27 - GEN	Circuit breaker 20 A generator
28 - ACC	Circuit breaker 10 A
29 -	Auxiliary outlet

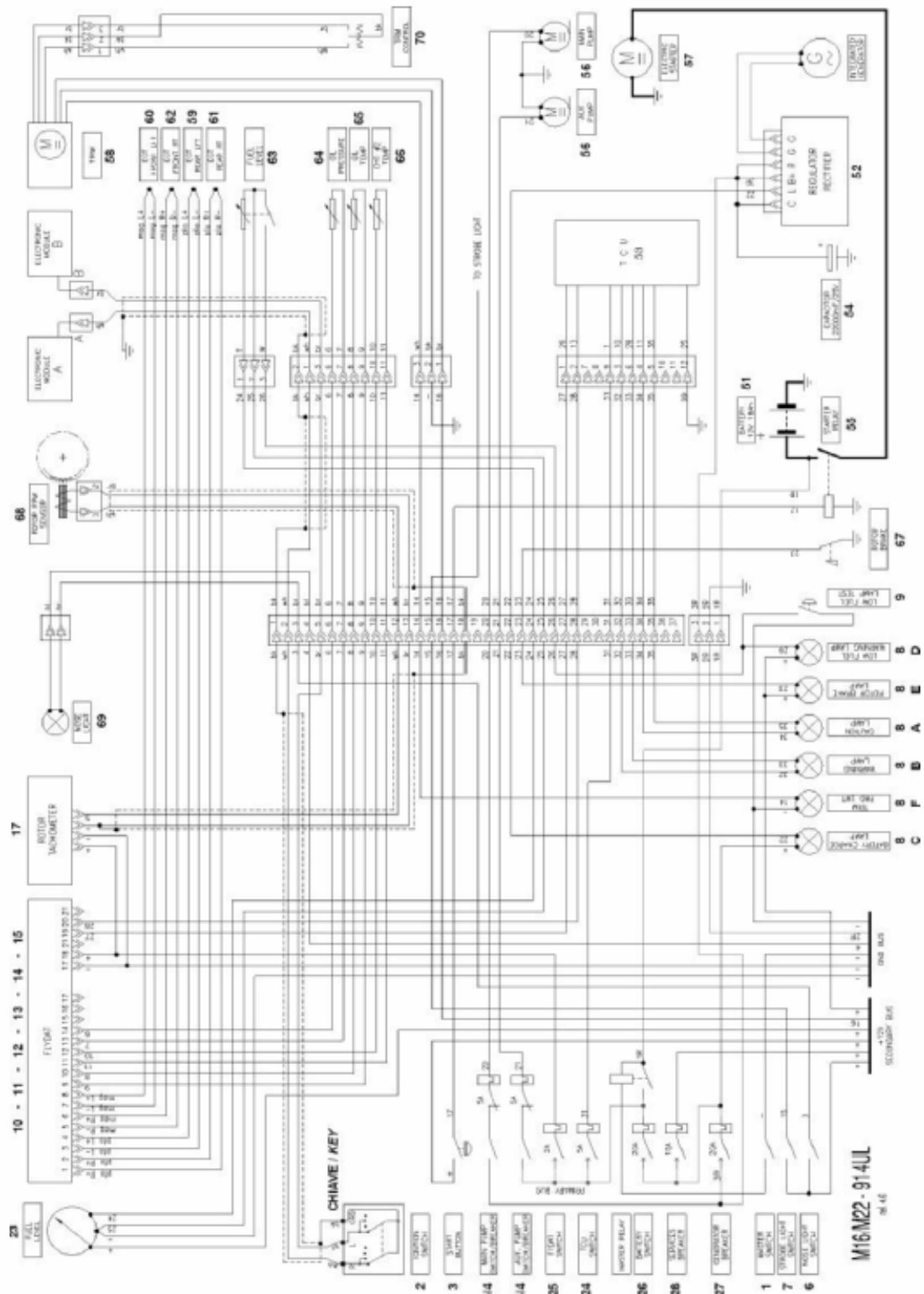


Figure 2.13.2 – Electrical System Wiring Diagram

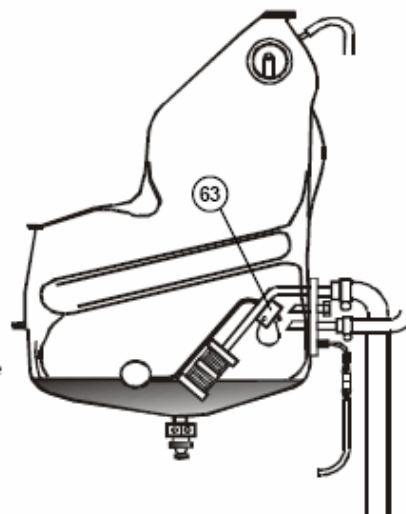
2.13.1 ELECTRIC SYSTEM VARIOUS DEVICES



**FIG. 2.13/3 ELECTRICAL SYSTEM
(VARIOUS DEVICE)**

- 51 - Battery 12 V - 18 Ah
- 52 - Regulator rectifier
- 53 - TCU (turbo control unit)
- 54 - Capacitor 22.000 mF/25 V
- 55 - Starter relay
- 56 - Main and auxiliary pump
- 57 - Electric starting motor
- 58 - Trim actuator
- 59 - Rear LH EGT (PTO L)
- 60 - Front LH EGT (MAG L)
- 61 - Rear RH EGT (PTO R)
- 62 - Front RH EGT (MAG R)
- 63 - Fuel level
- 64 - Oil pressure
- 65 - Oil temperature
- 66 - CHT 2 cylinders temperature
- 67 - Rotor brake
- 68 - Rotor rpm sensor
- 69 - Landing light
- 70 - Trim control

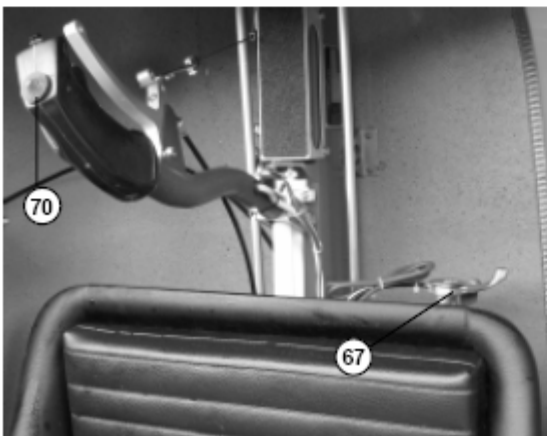
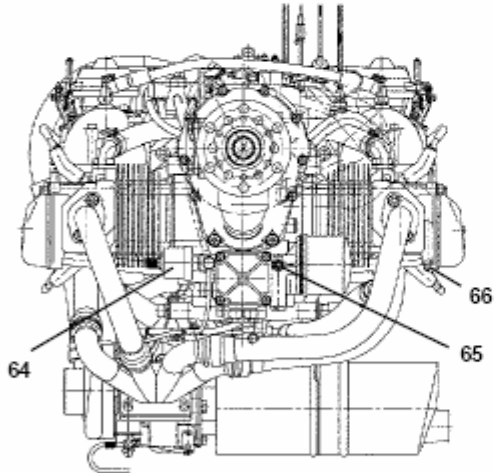
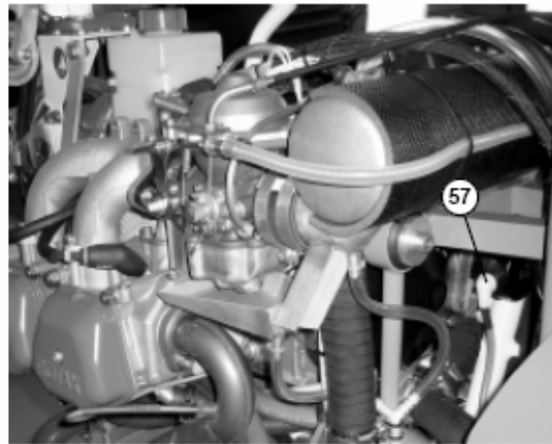
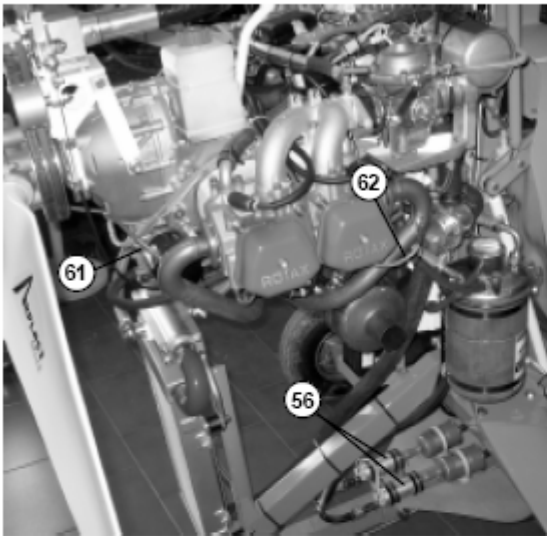
**SERBATOIO CARBURANTE
FUEL TANK**



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FIG. 2.13/3 IMPIANTO ELETTRICO
(DISPOSITIVI VARI)

FIG. 2.13/3 ELECTRICAL SYSTEM
(VARIOUS DEVICE)



2.14 FLIGHT INSTRUMENTS

2.14.1 AIR-SPEED INDICATOR (ASI)

(Item 1)

An air-speed indicator is installed on the right side of the instrument panel.

The air-speed indicator is gauged between 20 and 120 Kn. The indicated speed is monitored according to the difference between dynamic pressure and static pressure.

2.14.2 ALTIMETER (ALT)

(Item 2)

A three-pointer altimeter with 0 – 20,000 ft scale is installed on the right side of the instrument panel. The indicator is supplied with a barometric scale (in millbar) for monitoring the atmospheric pressure. The pressure is monitored through the apposite static head probe.

2.14.3 VERTICAL SPEED INDICATOR (VSI)

(Item 3)

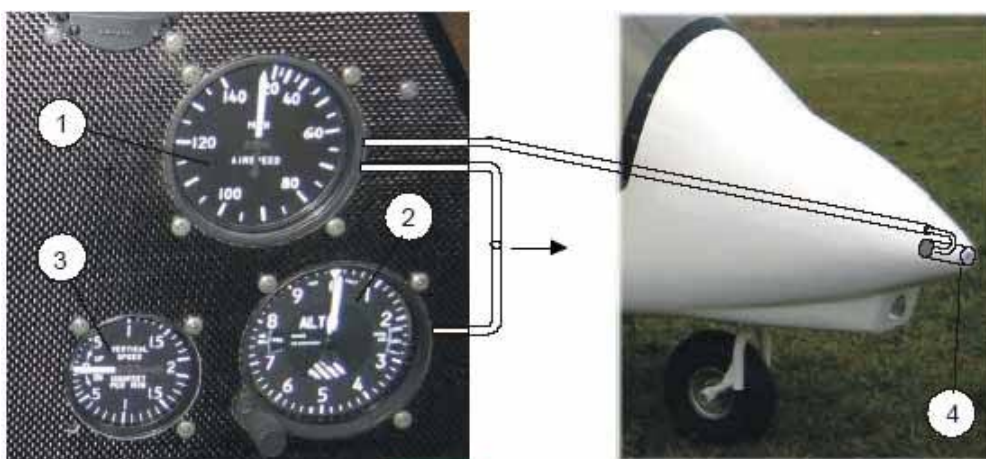
The vertical speed indicator is an optional instrument. It is positioned on the right side of the instrument panel, next to the altimeter.

This instrument is available in ft/min. It is connected to the static head probe.

2.14.4 STATIC AND DYNAMIC HEADS

(Item 4)

The dynamic head is located in the fuselage's front end. The static head probe is free in the cockpit.



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2.15 NAVIGATION INSTRUMENTS

2.15.1 COMPASS (Item 1)

A standard magnetic compass is installed on the upper right hand section of the instrument panel.

2.16 CONTROL INSTRUMENTS

2.16.1 ROTOR REVOLUTION COUNTER rpm. (Item 3)

The rotor revolution counter is placed above the FLYDAT instrument, on the left side of the instrument panel. The rotor's r.p.m. is read through a LCD display. This value is monitored by a magnetic sensor positioned close to the notched gear of the rotor head.

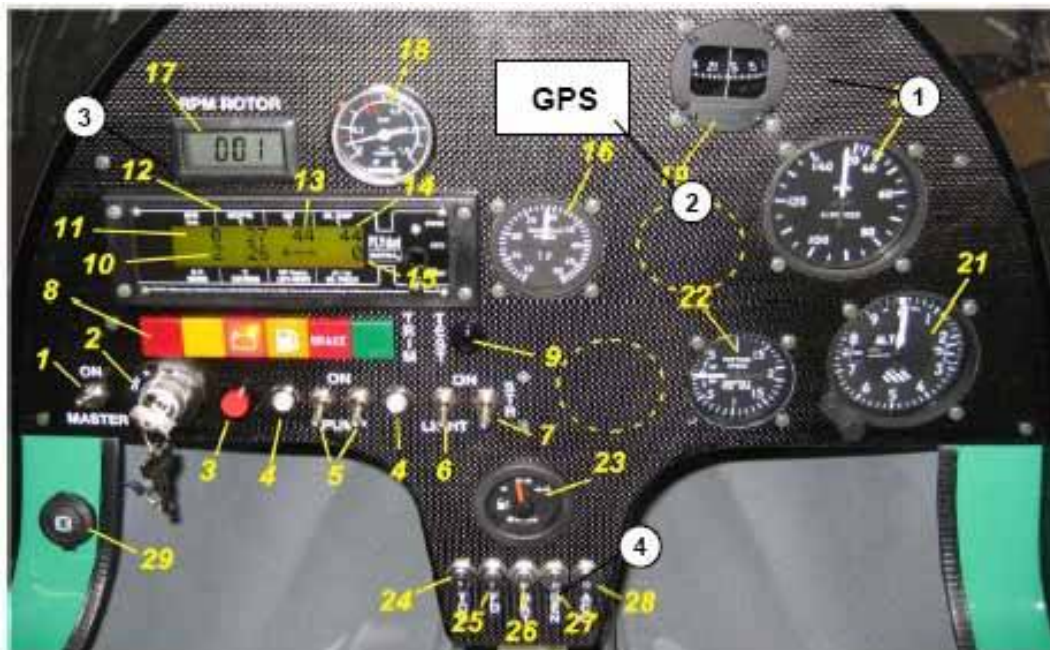
2.16.2 FUEL LEVEL INDICATOR (Item 4)

A fuel level indicator is positioned in the lower part of the instrument panel.

NOTE:



The fuel gauge fitted to the M16 and M16C reads 'FULL' when the content of the tank is over 55 litres. For fuel levels above 55 litres the pilot should verify the tank contents by use of the markings on the rear of the tank. Due to the tank's shape, the reading of the instrument is not linear.



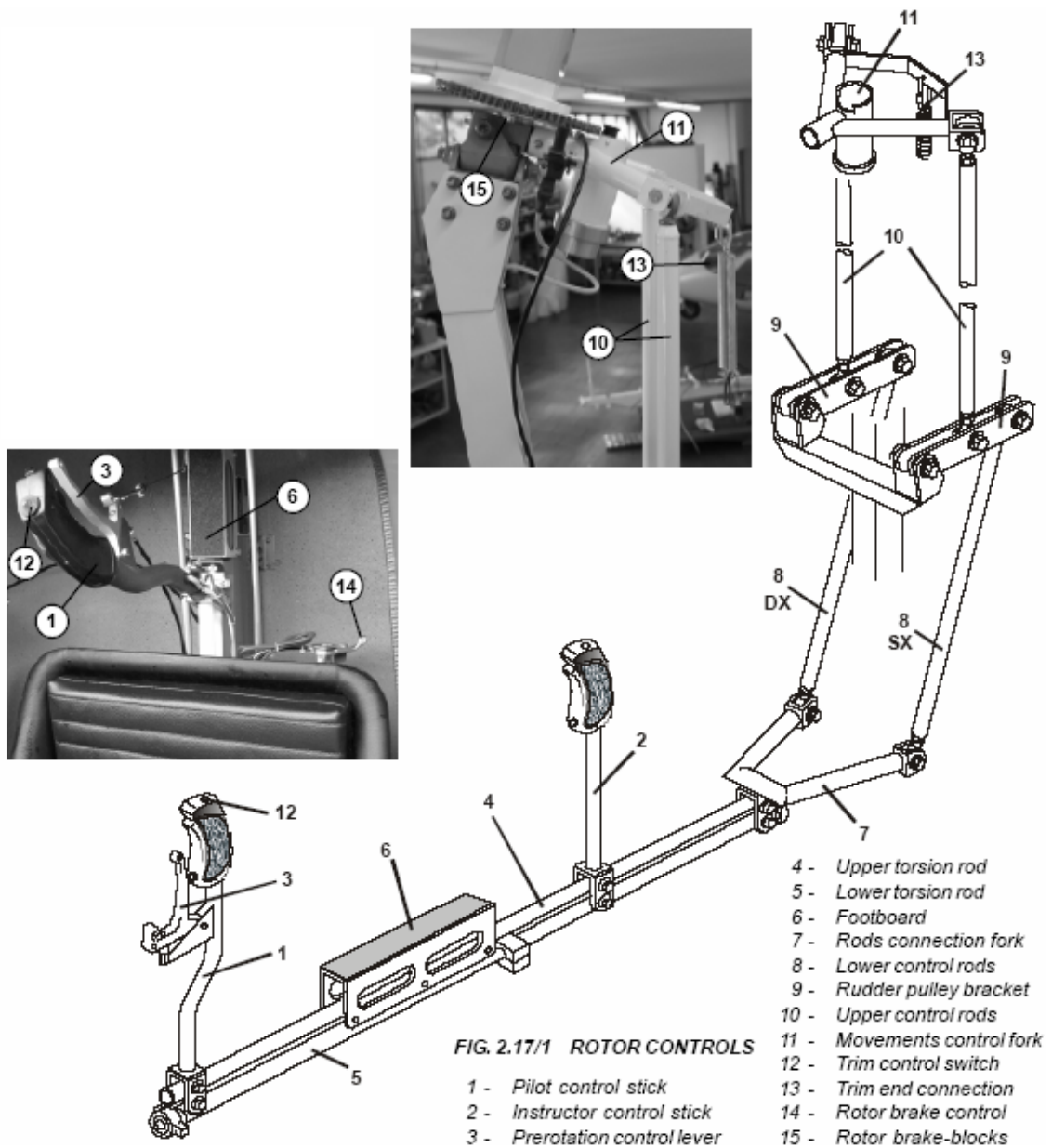
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2.17 FLIGHT CONTROLS

The three axes are controlled by the displacement of the rotor, which is articulated on the transversal axis, longitudinal axis and by the tail rudder.

2.17.1 ROTOR CONTROLS

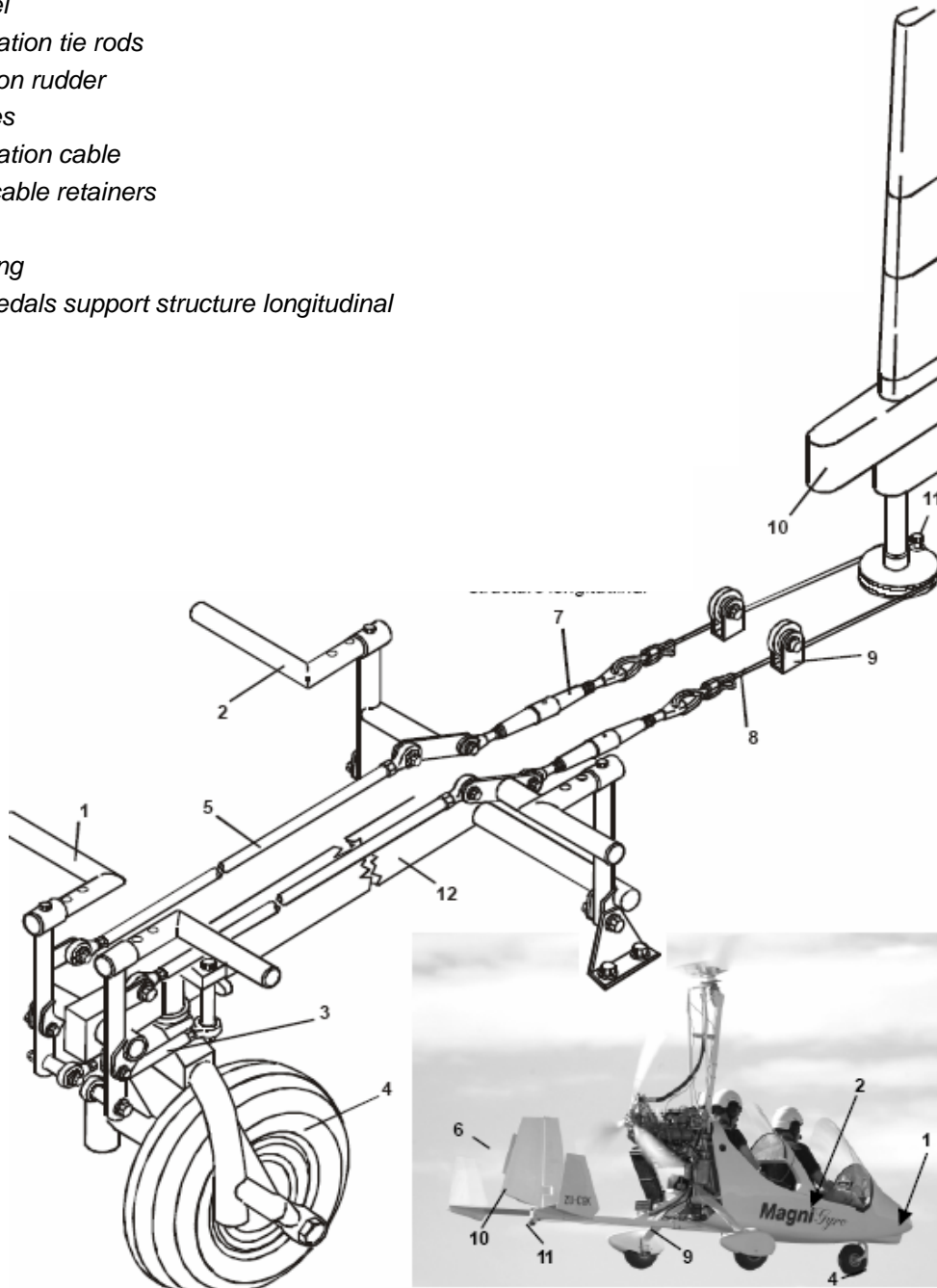
The flight controls on the rotor are mechanical. They are articulated on rigid rods and bearings. A cable connects the control lever to the rotor brake-blocks.



2.17.2 DIRECTION CONTROLS

The flight controls on the tail rudder are transmitted through cables and pulleys. The control pedals operate the rudder as well as the front wheel, thus determining the steering. The tail rudder is equipped with a fixed-type trim surface and cannot be controlled by the pilot.

- 1 - Pilot rudder pedals
- 2 - Instructor rudder pedals
- 3 - Wheel rotation tie rods
- 4 - Front wheel
- 5 - Rudder rotation tie rods
- 6 - Fixed trim on rudder
- 7 - Turnbuckles
- 8 - Rudder rotation cable
- 9 - 3 pairs of cable retainers
- 10 - Rudder
- 11 - Cable fixing
- 12 - Rudder pedals support structure longitudinal



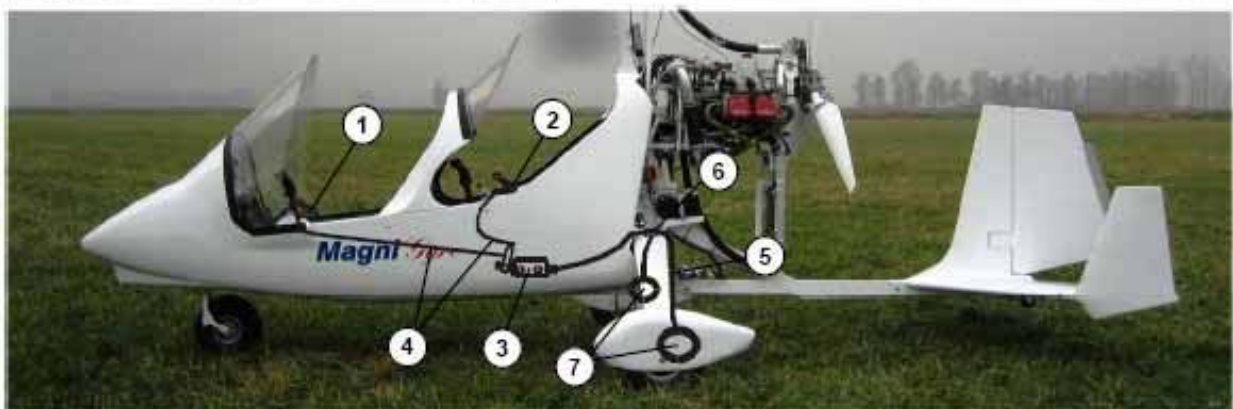
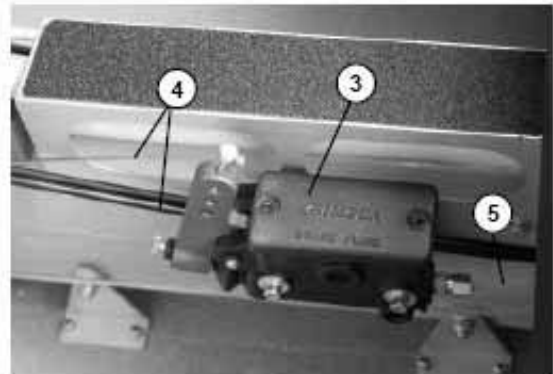
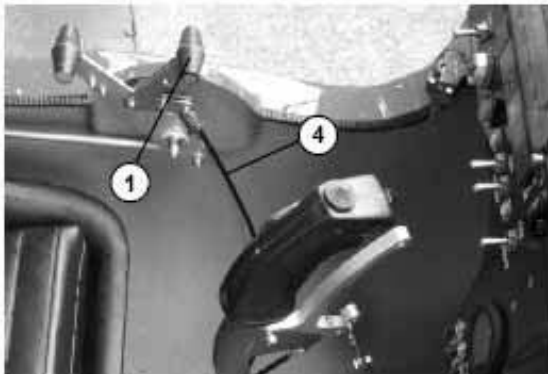
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2.18 BRAKING SYSTEM

The M-16 and M-16C models are fitted with conical disk hydraulic brakes. The hydraulic braking system is composed of operating levers, main pump, brake line and brake-blocks. The pump is equipped with an integrated tank for oil. The type of oil used in this system is either DOT 3 or DOT 4.

The brake pump is connected through cables and cable housings to the two brake levers, which are anchored to the throttle levers. Independent braking of each single wheel is not possible with this braking system.

- 1 - Pilot brake control lever
- 2 - Instructor brake control lever
- 3 - Brakes hydraulic pump
- 4 - Pump control cables
- 5 - Hydraulic system pipes
- 6 - Three-way connection
- 7 - Brake-blocks



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The brake lever is equipped with a parking brake lock.



The lock is rotated to locate on the pin protruding from the main brake lever.

The lock is secured by friction and is self releasing once the brake lever is squeezed back towards the throttle lever.

2.19 COCKPIT

The commander pilot sits in the front seat while the passenger or instructor sits in the rear seat.

The seats are not adjustable in height. The lengthwise adjustment is done through the pedals, which can be adjusted according to the pilot's leg length.

The cockpit is designed in such a way that the rear seat is slightly higher than the front one in order to increase the visibility of the instructor/passenger.

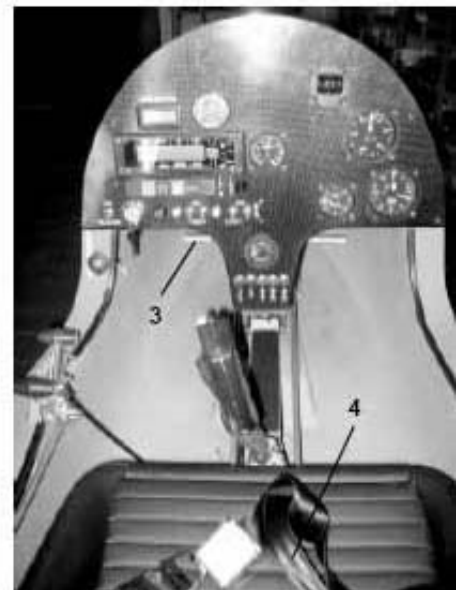
Both seats are adequately padded so as to guarantee pilot comfort.

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2.20 SAFETY BELTS

The safety belts both for the front and the rear seat are of 4 points type with quick release buckle.

- 1 - Pilot seat
- 2 - Instructor (or passenger) seat
- 3 - Lengthwise adjustable pedals
- 4 - 4 point safety belts



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2.21 EXTERNAL LIGHTING SYSTEM

(Item 1)

The external lighting system is composed of:

- Landing light (in the front part of the fuselage).
- Anti-collision lights (on request) (stroboscope in the upper part of the mast and under the fuselage).



2.22 INTERNAL LIGHTING

As night flights are strictly forbidden with this configuration of M-16 and M-16C models, the instrument panel is not equipped with instrument lighting.

The instrument panel is fitted with six warning lights, each with a precise meaning as indicated in Section 2.13.

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2.23 SERVICE - REFUELLING DATA

2.23.1 FUELS

The following fuels can be used:

		<i>Usage / Description</i>
		<i>U914 UL / F</i>
MOGAS		
<i>European standard</i>	<i>EN 228 Super ¹⁾</i>	
	<i>EN 228 Super plus ¹⁾</i>	
<i>Canadian standard</i>	<i>CAN/CG SB-3.5 Quality 3 ²⁾</i>	
<i>US standard</i>	<i>ASTM D4814</i>	
AVGAS		
<i>US standard</i>	<i>AVGAS 100 LL (ASTM D910)</i>	

¹⁾ min. ROZ 95

²⁾ min. AKI 91

AVGAS 100LL places greater stress on the valve seats due to its high lead content and forms increased deposits in the combustion chamber and lead sediments in the oil system. Thus it should only be used in case of problems with vapour lock or when other types of gasoline are unavailable.

2.23.2 BRAKE OILS

The type of oil used in this system is either DOT 3 or DOT 4

2.23.3 LUBRICANTS

Oil: **Motorcycle oil of a registered brand with gear additives.**
If using aircraft engine oil; than only a blended one.

Oil specification:

- Use only oil with API classification “SG” or higher!
- Due to the high stresses in the reduction gears, oils with gear additives such as high performance motor cycle oils are required.
- Because of the incorporated friction clutch, oils with friction modifier additives are unsuitable as this could result in a slipping clutch during normal operation.
- Heavy duty 4-stroke motor cycle oils meet all the requirements. These oils are normally no mineral oils but semi or full synthetic oils.
- Oils primarily for Diesel engines are due to insufficient high temperature properties and additives which favour clutch slipping, generally unsuitable.

CAUTION:



If the engine is mainly run on AVGAS more frequent oil changes will be required.

Oil consumption: max 0,06 l/h (0.13 liq pt/h)

Oil viscosity: Use of multi-grade oils is recommended.

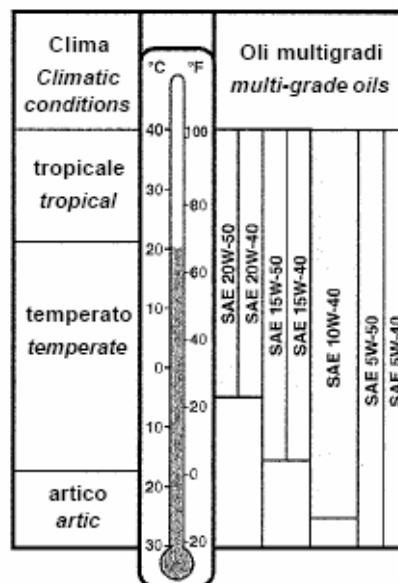
NOTE:



Multi-viscosity grade oils are less sensitive to temperature variations than single grade oils. They are suitable for use throughout the seasons, ensure rapid lubrication of all engine components at cold start and get less fluid at higher temperatures.

Table of lubricants

Since the temperature range of neighbouring SAE grades overlap, there is no need for change of oil viscosity at short duration of ambient temperature SAE fluctuations.



SECTION 3

3 FLIGHT PROCEDURE

3.1 OPERATION LIMITS

See SECTION 5.

3.2 FLIGHT PLANNING

The reference data for flight planning are described in the APPENDICES.

3.3 TAKE-OFF AND LANDING DATA

The information necessary to find the takeoff and landing data is contained in APPENDIX 2.



NOTE:

The technique for take-off on rough grass is to spin up to a higher rotor rpm than usual to be able to accelerate at max continuous power until balancing on main wheels. Then apply max take-off power to clear the grass as soon as possible. Aircraft should then be accelerated to about 60kn then climb as normal.

3.4 WEIGHTS AND BALANCING

The limits of weights and balancing are quoted in Section 5 and APPENDIX 1.

3.5 PILOT CHECKLIST

A concise checklist is supplied to the pilot as separated publication

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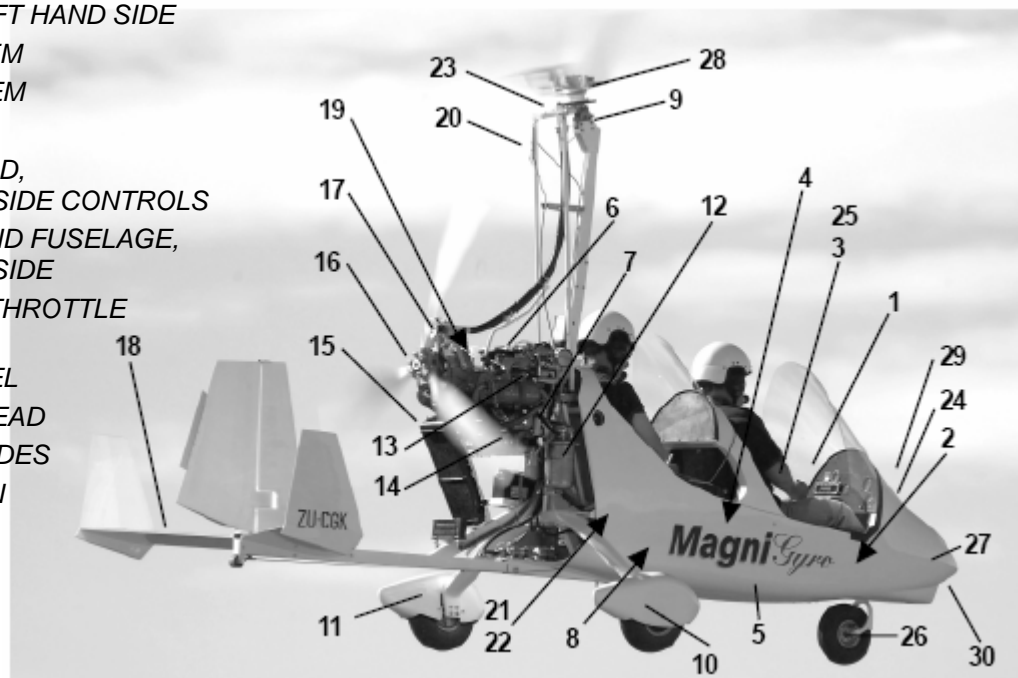
3.6 DAILY PREFLIGHT CHECKS



WARNING DANGER:

Perform these checks before the first flight of the day (gyroplane rigged and fuelled). A diligent and comprehensive preflight check is an essential factor for safe operation of any aircraft. It is strongly recommended that the preflight checks be carried out systematically and thoroughly prior to flight as per hereunder copied checklist.

- 1 - INSTRUMENT PANEL
- 2 - CHECK OF PEDALS
- 3 - CHECK OF CONTROL STICK
- 4 - CHECK INSIDE OF COCKPIT
- 5 - COCKPIT AND FUSELAGE, RIGHT HAND SIDE
- 6 - COOLANT LEVEL
- 7 - ENGINE OIL LEVEL
- 8 - FREEDOM AND ENTIRENESS OF CONTROL RODS
- 9 - ROTOR HEAD, RIGHT HAND SIDE
- 10 - UNDERCARRIAGE, RIGHT HAND SIDE
- 11 - WHEELS AND WHEEL PANTS
- 12 - ENGINE MOUNT, RIGHT HAND SIDE
- 13 - ENGINE, RIGHT HAND SIDE
- 14 - EXHAUST SYSTEM, RIGHT HAND SIDE
- 15 - RADIATORS
- 16 - PROPELLER
- 17 - PRE-ROTATION SYSTEM
- 18 - TAIL PLANES
- 19 - ENGINE, LEFT HAND SIDE
- 20 - TRIM SYSTEM
- 21 - FUEL SYSTEM
- 22 - FUEL LEVEL
- 23 - ROTOR HEAD, LEFT HAND SIDE CONTROLS
- 24 - COCKPIT AND FUSELAGE, LEFT HAND SIDE
- 25 - CHECK OF THROTTLE LEVERS
- 26 - NOSE WHEEL
- 27 - DYNAMIC HEAD
- 28 - ROTOR BLADES
- 29 - NAVIGATION SYSTEM
- 30 - LIGHTING SYSTEM



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3.6.1 INNER CHECKS

1. INSTRUMENT PANEL

Check that the MASTER switch is in OFF-position and that all the breakers are switched OFF.

2. CHECK OF PEDALS

Check the condition and linkage of the rudder pedals. Ensure full and free movement over the entire range (nose wheel off ground).

Check the functioning of the pedals and their correct setting depending on pilot height. Verify the entireness of the transmission rods and the presence of the safety wiring on the cable turnbuckles.

3. CHECK OF CONTROL STICK

Verify full and free of movement of the control sticks. Verify that no damage occurred to the control and torsion rods and verify the fixing of these same rods.

Check the functioning of the pre-rotator lever on the front control stick.

4. CHECK INSIDE OF COCKPIT

Ensure that no debris, equipment or cargo will cause any restriction to the controls. Ensure that seats are secure and free from any damage. Examine instrument panel and instruments and ensure that all are in good working condition with all nameplates and markings present and legible.

3.6.2 EXTERNAL CHECKS

5. COCKPIT AND FUSELAGE, RIGHT HAND SIDE

Check the condition of the external surface of the fuselage and remove any foreign object or dirt. Ensure it is clean. Check that the windscreens are fixed well and not damaged. Ensure correct visibility. Examine pilot and passenger restraint systems and make sure they are not damaged. Pay particular attention to any cut, chafing, contamination, worn latch or boss, loose or pulled stitching and any other factors you feel may cause you to doubt their durability and usability. Check the condition and safety of the fuel cap.

6. COOLANT LEVEL

Carefully open the expansion tank placed on the engine (do not mistake it with the white expansion tank) and check the correct level of the coolant in the tank. See paragraph "Coolant level".

7. ENGINE OIL LEVEL

Verify correctness of the engine oil level, checking the measuring stick inside the oil tank.

Note, to check the oil level any residual oil in the crankcase must be returned back to the tank. This is done by removing the filler cap from the oil tank and then "hand turning" the prop in the correct direction of rotation until a gurgle sound is heard coming from the tank. This sound indicates that air, not oil, is now being forced out of the crankcase and the bulk of the oil is in the tank.

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8. FREEDOM AND ENTIRENESS OF CONTROL RODS

Closely examine the state and safety of the safety points on the control rods, linkages, bearings and fibrelock nuts. There should be insignificant play in the "Uniball" rod end bearings and no evidence of corrosion or damage.

The control rods should be straight and undamaged. The control rods should be free to rotate slightly around their axis when gripped and given a light twist. Any undue force needed or inability to twist the bearing may indicate a problem of the bearing and should be further investigated.

9. ROTOR HEAD, RIGHT HAND SIDE

Standing upright or on a ladder, check that all the rotor head nuts are fixed well and that all the safety locking systems are present and functional. Examine as far as possible the rotor head and hub-bar assemblies for cracks, damage, wear, corrosion and rubbing. Check the state of the teeth and make sure they are not damaged. Make sure the flexible shaft and the Bendix pre-rotation gear are adequately coated with grease. Check the state of the notched gear.

10. UNDERCARRIAGE, RIGHT HAND SIDE

Check the state and safety of the leaf spring and mounting bolts.

11. WHEELS AND WHEEL SPATS

Check the state and safety of the anchoring of the wheel, hub, axle and wheel spats. Check all the tires and make sure their inflation pressure is correct. Check their state, possible damage and unbalance of rubbing marks. Either roll the gyroplane forward or remove the wheel spats to check all the tires. Ensure any dirt and debris have been removed from inside the wheel spats. Examine as far as possible the state of the braking system. Ensure the components of this system show no leaks or damage. Check the brake lines and make sure there is no evidence of bending or chafing.

12. ENGINE MOUNT, RIGHT HAND SIDE

Inspect the welding points of the engine mount and check that there is no crack, damage or chafing. Check the entireness of the vibration dampers and make sure the fixing bolts are tightened correctly. Check the welds of the structure for cracks and damages.

13. ENGINE, RIGHT HAND SIDE

Check the safety, corrosion, state, levels, leaks, damage and chafing of the following components:

- carburetors, linkages and cables
- airbox fixing
- wirings and connections
- cooling system
- oil reservoir and oil
- oil filter
- radiator and oil radiator
- spark plugs and their connection coverings
- engine feelers, connectors and fasteners
- oil and coolant hoses and clamps
- on 914-TCU and its mount
- exhaust system, springs, joints, mounts and safety wires
- pre-rotation assembly, belts, cables and flexible shaft

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14. EXHAUST SYSTEM, RIGHT HAND SIDE

Verify the entireness of the exhaust system, checking that there are no cracks in the exhaust pipes. Check the correct fixing of the exhaust gas temperature probes.

15. RADIATORS

Inspect the radiant surfaces and verify that there are no leaks of liquid, damage or chafing. Verify the functioning of the radiator chocking system of the radiant surfaces and the entireness of the clamps and fixing points.

16. PROPELLER

Check the hub bolts and the propeller support flange. Check the whole surface of each blade for any signs of damage or de-bonding. Make sure the blades are clean.

17. PRE-ROTATION SYSTEM

Verify the correct positioning of the pre-rotation assembly and the condition and the tension of the belts. Check the functioning of the pre-rotation system and the freedom of movement of the lever of the belt tensioning pulley. Verify the correct position of the pulleys' brake shoe and check the wear of the pulleys.

18. TAIL PLANES

Check all the lower and upper surfaces and make sure they are free of cracks or damage. Check the anchoring of the tail planes. Check the safety of the rudder and make sure it is completely free to move. (Push down so that the nose wheel is lifted, thus reducing the strain on the controls). Check the state and freedom of movement of the tail wheel.

19. ENGINE, LEFT HAND SIDE

Proceed as for the right side. Furthermore check the state of the battery and look for signs of overheating, excessive venting, corrosion of terminals or leakage of acid. Check the voltage regulator and the starter contactor for signs of overheating, short circuits or corrosion. Check the state of the air filter and make sure it is fixed well. Check the ROTAX 914 turbocharger unit, air filter, waste gate and springs, waste gate motor and cable.

20. TRIM SYSTEM

Verify the correct fixing of the trim actuator and the entireness of the control cable, springs and electric connections.

21. FUEL SYSTEM

Verify that the quantity of fuel is adequate for the flight planned. Examine the fuel pipes and connectors for serviceability and any sign of leakage. Ensure the fuel filter is clean and that there are no signs of leaks. Draw a sample of fuel from the drain point and check the sample for any water or other contaminant. Check the fuel tank surfaces and seams.

22. FUEL LEVEL

Check the fuel level.

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WARNING:



This operation must be done taking advantage of the tank transparency. Keep the gyroplane on three points (nose down) so as to be able to correctly evaluate the quantity of fuel in the tank. It is strongly recommended to check the level looking at the rear left side of the tank.

23. ROTOR HEAD AND CONTROL RODS, LEFT HAND SIDE

Proceed as per the right side. Furthermore, check the rotor brake and cables for freedom of movement and make sure they do not need any maintenance. Check the state of the rotor tachometer pick-up and make sure it is fixed well.

24. COCKPIT AND FUSELAGE, LEFT HAND SIDE

Proceed as per the right side.

25. CHECK OF THROTTLE LEVERS

Check that the full range of movement is available to the throttle lever, with no binding or restriction.
- As regards the ROTAX 914, ensure that the front throttle lever can be extended past the 100% stop and reach the 115% stop. Check the state of the brake levers. Make sure that the maximum braking power is available and that the lever turns back when released.

26. NOSE WHEEL

Check the state of the nose wheel and ensure its correct inflation pressure. Check that the full range of movement is available to the wheel and that it operates in the correct direction with the rudder. Check the fork for any sign of damage or distortion. Check that the wheel is free to spin, without play in the bearings. Make sure the axle nut is secure.

27. DYNAMIC INTAKE

Make sure there are no obstructions, dirtiness or other clogging inside the dynamic intake.

28. ROTOR BLADES

Make sure the rotor blades are free from any damage or other defect. Make sure they are clean.

29. NAVIGATION SYSTEM

Check the functionality of all the navigation and communication systems.

30. LIGHTING SYSTEM

Check the functionality of all the internal and external lighting systems.

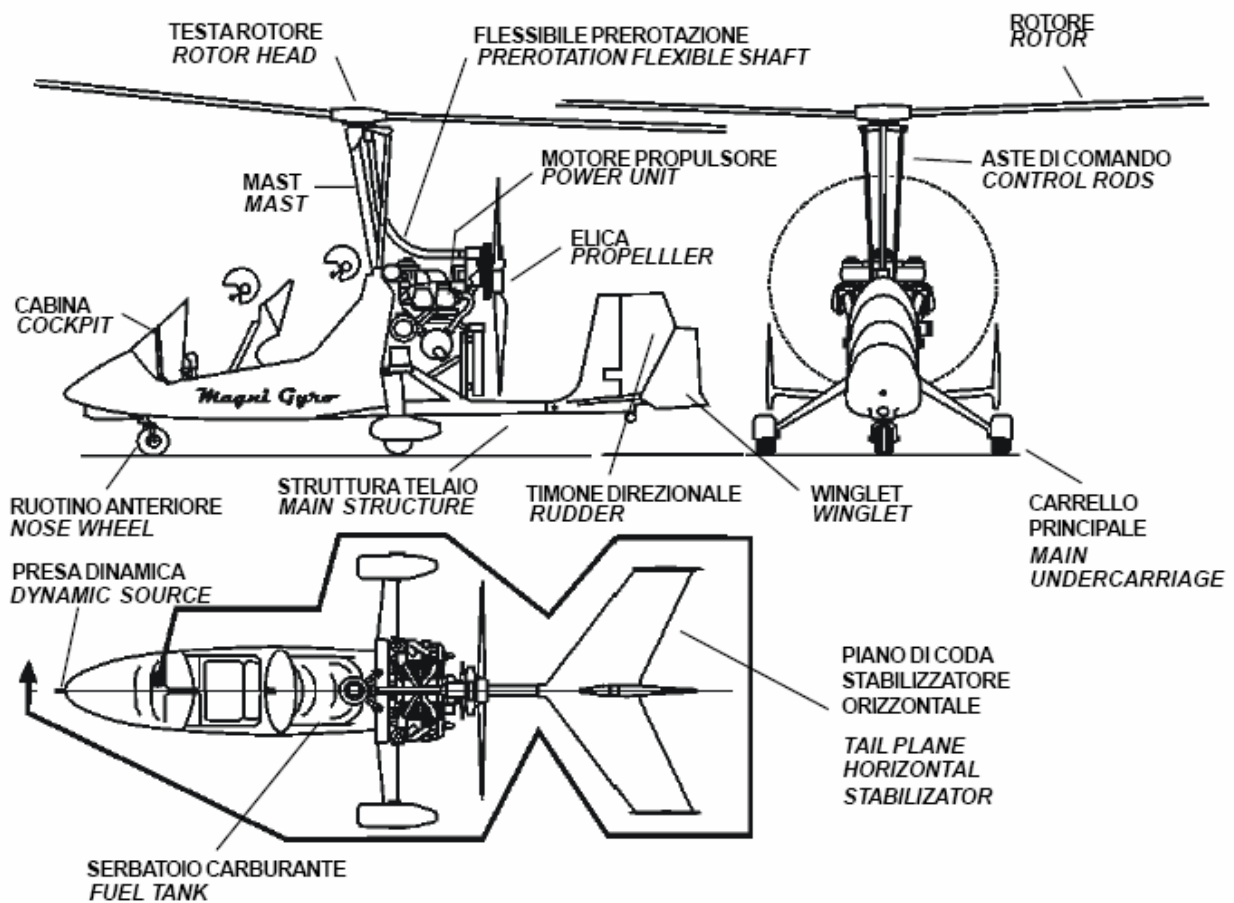
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WARNING:

INITIALLY THE DAILY/PREFLIGHT CHECKS MAY SEEM A LONG PROCEDURE, BUT WITH EXPERIENCE, THE PILOT WILL SOON BECOME FAMILIAR WITH ALL THE ASPECTS OF THE AIRCRAFT AND WHAT IS CORRECT OR NOT. THE CHECK IS ORGANIZED INTO A LOGICAL PATTERN THAT MAKES ONE COMPLETE ROUND OF THE GYROPLANE AND BECOMES SECOND NATURE WITH PRACTICE. THIS PATTERN STARTS WITH THE INSPECTION OF THE INSTRUMENT PANEL AND CONTINUES CLOCKWISE AROUND THE GYROPLANE, AS DESCRIBED IN THE FOLLOWING FIGURE.

Fig. 3.6/2 PERCORSO ISPEZIONE - INSPECTION PATTERN



WARNING:

The importance of this check and the level of diligence needed during it cannot be overemphasized. A well-executed daily/preflight check is probably one of the greatest contributing factors to good flight safety.

3.6.2 ORDINARY MAINTENANCE SCHEDULE

The correct maintenance of the gyroplane avoids troubles and inconvenience that can compromise the safety of flight operations. For both the M16 and the M16C models, Magni Gyro strongly recommends complying with the published M16C Maintenance Schedule – 045-00-16C.

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3.7 ENGINE PROCEDURES

3.7.1 NOTES ON USE OF ENGINE

The engine must be started in accordance with the latest applicable version of the relevant Rotax operators manual.



WARNING DANGER:

This manual must be read and fully understood before starting the engine. Failure to do so will lead to an extremely hazardous situation with great risk of injury or death. Refer to the Magni Gyro Gyroplane Pilot's Flight Manual before attempting an engine start sequence.

Once the engine is started and warmed up, carry out a full functional check of all the engine indicating systems and of its warming up. The engine is cooled by the pressure of air passing through the cylinders and by the radiator. The air pressure is guaranteed by the movement of the gyroplane. During ground operations, the following precautions are recommended in order to avoid any overheating:

- As far as possible, keep the gyroplane upwind.
- Avoid any prolonged waiting.
- Constantly check the operation temperature.

During flight, always respect the following recommendations:

- Do not exceed the maximum engine r.p.m. parameters.
- Do not exceed the maximum temperature parameters.
- Do not exceed the maximum oil pressure parameters.
- Carefully follow the limits set by the engine manufacturer and indicated in the operators manual.

3.7.2 ENGINE OPERATION LIMITS

Operating Temperatures

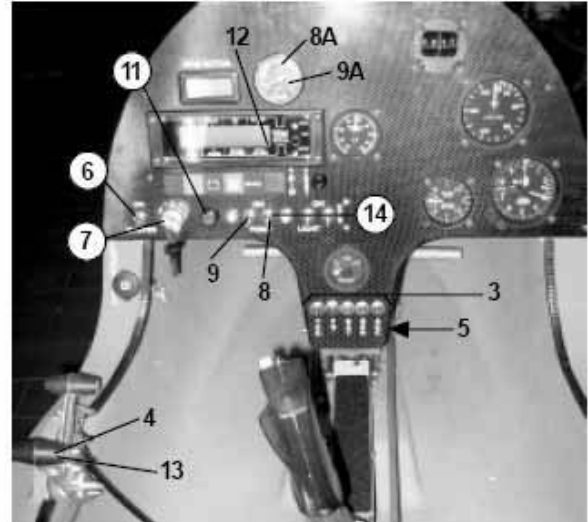
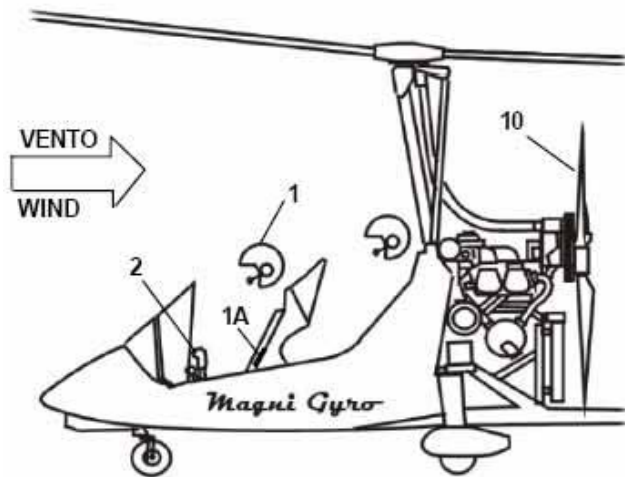
	Min	normal	Max
OIL.....	50	90-110	130
CHT.....	50	90-110	135
EGT.....		750-850	950
OIL (bar).....	1.5	2.5	7
Rpm.....			5800
Cruising.....		to 75% of power	
Rpm.....			5000
MAP.....			30.5

3.7.3 USE OF HOT AIR TO CARBURETTORS

Not applicable for the ROTAX 914 engine

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3.7.4 ENGINE STARTING



WARNING DANGER:

Before starting the engine, make sure that the area surrounding the propeller is free of objects and people.

1. CHECK STICK RETAINER IS APPLIED
2. HELMET (1) and BELTS (1A) - fastened and well positioned
3. CONTROL STICK - in forward position
4. BREAKERS - switched ON
5. THROTTLE LEVER - in "minimum" position (idle) & PARKING BRAKE on.
6. CHOKE - ON, lever in raised position (only if engine is cold)
7. MASTER - switch ON
8. KEYS - in BOTH position (3 clicks)
9. AUX. PUMP TEST - ON / check "fuel press" indication in green range / OFF (8A)
10. MAIN PUMP - ON / check "fuel press" indication in green range (9A)
11. PROPELLER – free



WARNING DANGER:

Shout "CLEAR PROP".

12. HOLD BRAKES ON
13. STARTING - push start button



WARNING:

Should the starting be difficult, keep the starter push button pressed for several seconds. In order not to damage the starting system, it is recommended to press the button for not more than 10 seconds at a time and then to wait 1 minute before pressing again.

14. OIL PRESSURE - check the pressure on the FLYDAT instrument and make sure the pressure rises within the limits requested (**from 1,5 up to 5,0 bar**).

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WARNING:

Should the pressure not reach the minimum specified level within 10 seconds, stop the engine and look for the defect.

15. THROTTLE LEVER - Set it in such a way as to reach a speed of 1800 - 2000 r.p.m.
16. AUXILIARY PUMP - ON. Check pressure parameters in green range.

3.7.5 STARTING FAILED

Should the starting fail, repeat the procedure from point 4 onward, keeping the throttle lever in a slightly forward position.

IF THE EXTERNAL TEMPERATURES ARE LOW: AIR - ON / lift the choke lever.

Repeat the complete starting procedure. AIR - OFF / lower the choke lever within one minute after the engine has started.

3.8 TAXIING TO THE HOLDING POINT



WARNING DANGER:

It is necessary to proceed very carefully during all the ground operations. The control stick must be kept in the full-forward position (nose down), either manually or through the dedicated control lock. Keep an appropriate safety distance from people and/or objects, especially when the rotor is rotating.



WARNING:

To reduce the lateral dimensions when the gyroplane is standing still, it is necessary to always align the rotor with the longitudinal axis of the gyro. Furthermore, the rotor must be braked with the brake lever.



WARNING DANGER:

It is strictly forbidden to leave the gyroplane whenever the rotor is moving.

3.8.1 CHECK OF ONBOARD APPLIANCES

- RADIO APPLIANCES - On if requested INTERPHONE APPLIANCES - On if requested
- NAVIGATION SYSTEMS - On if requested HOUR COUNTER, CLOCK – Check
- RADIO CALL - On request

3.8.2 CHECK OF TAXIING AREA

- MOVEMENT AREA - Free
- ROTOR BRAKE - ON, brake lever raised, brake warning light on
- ROTOR - Check dimensions, rotor along longitudinal axis
- BRAKES - Check effectiveness
- FLIGHT INSTRUMENTS – Check

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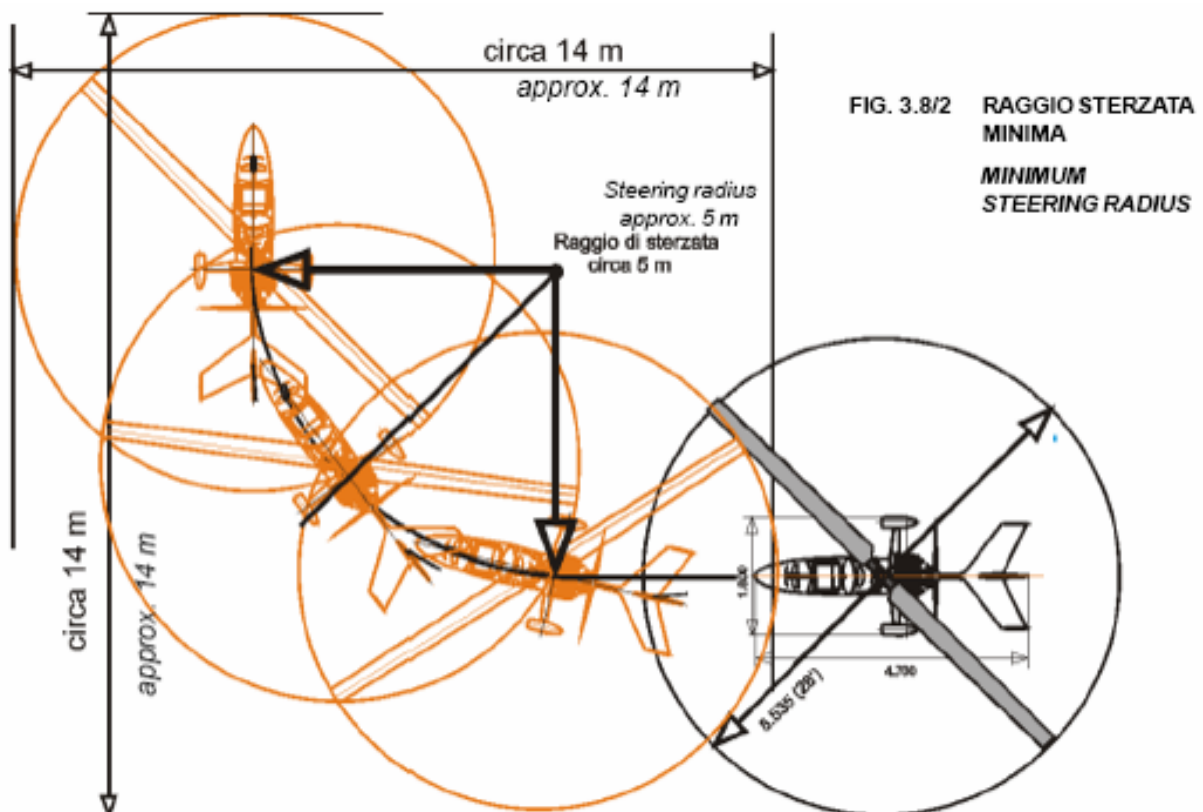
WARNING:

The nose wheel is fixed mechanically to the rudder pedals through the steering system. Do not press the pedals too much as long as the gyroplane is standing still. The brakes must be used only at the end of the landing roll or when stopping the gyroplane during the taxiing operations, and only with the engine at minimum r.p.m.



NOTE:

Fig. 3.8/2 shows the minimum steering radius.



3.8.3 TAXIING TO TAXI-HOLDING POINT

(See fig. 3.8/3)

Purpose	<p>Move the gyroplane from the parking area to the taxi-holding point. Preparation</p> <p>Control stick all forward.</p> <p>Start engine.</p> <p>Visually check external freedom of movement.</p>
Execution	<p>Identify runway to use.</p> <p>Gently vary the throttle to start taxiing to taxi-holding point.</p> <p>Manage steer with rudder pedals</p> <p>Manage taxiing with throttle lever and brakes</p> <p>Always stop gyroplane before crossing runway and make sure there is no traffic before crossing</p> <p>Stop gyroplane at taxi-holding point.</p>

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WARNING:

Fast taxiing on rough grass is not recommended which may cause excessive loadings and deflections of the rotor blade

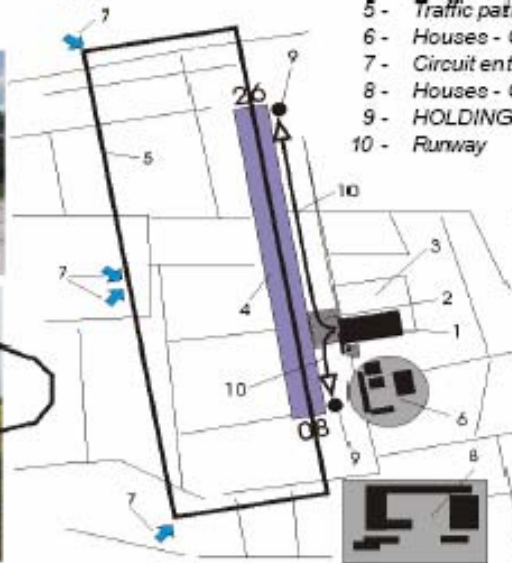
FIG. 3.8/3 RULLAGGIO AL PUNTO ATTESA

- | | |
|---------------------------|-------------------------------|
| 1 - Angar | 6 - Case - Proibito sorvolare |
| 2 - Parcheggio velivoli | 7 - Ingressi al circuito |
| 3 - Parcheggio automobili | 8 - Case - Proibito sorvolare |
| 4 - Pista 08 - 26 | 9 - PUNTO ATTESA |
| 5 - Circuito di traffico | 10 - Via di rullaggio |



FIG. 3.8/3 TAXIING TO TAXI-HOLDING POINT

- | |
|--|
| 1 - Hangar |
| 2 - Aircraft parking area |
| 3 - Car parking area |
| 4 - Runway 08 - 26 |
| 5 - Traffic pattern |
| 6 - Houses - Over flying is prohibited |
| 7 - Circuit entries |
| 8 - Houses - Over flying is prohibited |
| 9 - HOLDING POINT |
| 10 - Runway |



3.9 PRE-TAKEOFF CHECKS



NOTE:

Before entering the runway and while in the taxi holding point, execute the pre-takeoff checks as scrupulously as possible.

1. CHECK STICK RETAINER IS APPLIED
2. CHOKE - OFF lever lowered
3. BREAKERS - switched ON
4. MASTER - ON
5. APPLY PARKING BRAKE & HOLD BRAKES ON
6. IGNITION TEST - set engine at 2500 - 3000 r.p.m.
Use key to select various types of ignition. Verify that r.p.m. drop is within 300 r.p.m. and that it does not exceed 150 r.p.m. between one ignition and the next one.
7. BOTH KEY
8. PUMPS - ON, check both
9. LIGHT - ON
10. FUEL RESERVE - press test push button and check functionality of reserve warning light
11. MINIMUM TEMPERATURES - reaching minimum parameters (50° OIL and CHT)
12. ENGINE INSTRUMENTS - check in green range
13. TRIM NOT ENGAGED - move trim switch forward, check if green warning light is ON
14. HELMET AND BELTS - fastened and positioned correctly
15. FLIGHT INSTRUMENTS - check (set altimeter)

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**M16 TANDEM TRAINER
FLIGHT MANUAL**

16. ROTOR BRAKE - OFF, lever lowered, BRAKE OFF warning light
17. CONTROL LOCK- release and hold stick fully forward
18. RELEASE PARKING BRAKE
19. AIRPORT TRAFFIC CHECK

3.10 ROTOR PRE-ROTATION



CAUTION:

Keep the control stick all forward until reaching 130 r.p.m. rotor speed.

1. ALIGNMENT - runway alignment
2. ENGINE SPEED - set at 1800 r.p.m.



CAUTION:

A lower or higher engine speed may worsen the pre-rotation procedure performances.

3. PRE-ROTATION ENGAGING - gently operate the pre-rotation lever.
Keep engine speed at 1800 r.p.m.



CAUTION:

The pre-rotation must be engaged in a gentle manner, without sudden movements of the lever, so as not to stress the system and avoid stopping the engine.

AT 130 r.p.m. ROTOR SPEED

4. CONTROL STICK - Place the control stick in takeoff position (rear limit stop).
5. PRE-ROTATION LEVER - Gently reach the limit stop while keeping a constant engine speed.

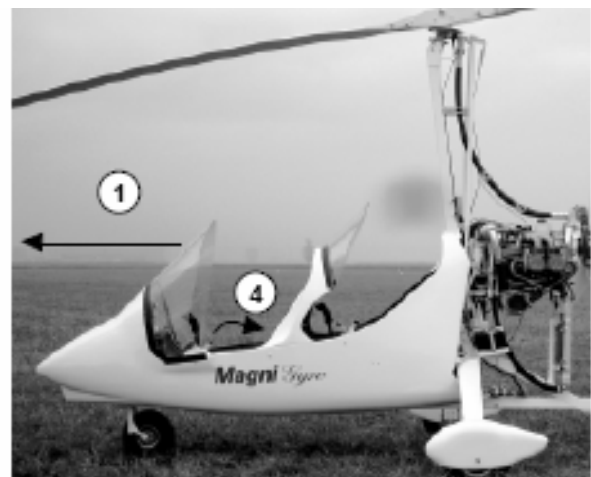
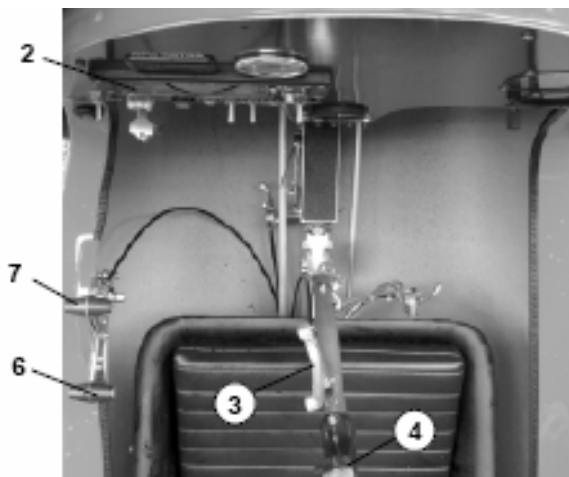
AT LIMIT STOP OF PRE-ROTATION LEVER

6. ENGINE r.p.m. - Gently increase the engine speed until reaching 200 r.p.m. of the rotor (standard pre-rotation).



WARNING DANGER:

The minimum rotor pre-rotation value is 150 r.p.m. It is strictly forbidden to proceed with takeoff operations if the rotor r.p.m. is inferior to this minimum value.



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NOTE:



Under identical conditions of power, the length of the takeoff run depends on the rotor r.p.m. reached during pre-rotation. The maximum speed of the pre-rotation system is 280 r.p.m. The life of the pre-rotation system and its inspection frequency depend on the average rotor r.p.m. applied during the pre-rotation operation.

WARNING DANGER:



If it is not possible to reach the minimum rotor r.p.m. during pre-rotation, stop the operation and return to the parking area.

7. BRAKES - release.
8. RELEASE PRE-ROTATION LEVER - once the rotor turns at 200 r.p.m., quickly release the pre-rotation lever (3).

WARNING DANGER:



It is strictly forbidden to operate the pre-rotation lever (3) apart from the pre-rotation procedure.

3.11 TAKE-OFF

NOTE:



DEFINITIONS:

CIRCUIT: *the circuit is composed of four legs connected by 90° turns*

TAKEOFF LEG: *climb*

CROSSWIND LEG: *climbing until reaching the circuit level*

DOWNWIND LEG AND BASE: *in horizontal flight*

FINAL: *alignment for landing*

1. THROTTLE LEVER - Increase the throttle in a progressive and smooth manner.

WARNING DANGER:



In order to guarantee a safe takeoff, the engine's power must increase progressively until reaching the maximum allowed value (100% or 115% for short takeoffs).

WARNING:



If the pre-rotation occurs with a rotor speed lower than 200 r.p.m., the acceleration must happen gradually. Increasing the r.p.m. must be done very carefully.

2. ALIGNMENT - use the rudder pedals to keep the alignment on the runway.
3. CONTROL STICK - in takeoff position (rear limit stop).
Once the nose wheel is lifted, move the control stick forward and balance the gyroplane on the main wheels.

WARNING:



During the balancing phase, the trim must be kept so that neither the nose wheel (pitch down) nor the rear wheel (pitch up) touch the ground.

4. TAKEOFF:
 - A) correct the roll induced by the engine torque (stick to the left);
 - B) reach and maintain attitude so as to obtain a speed of 60 kn.

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NOTE:

After initial take-off it is recommended to accelerate to 60Kn in a level attitude at no more than 10ft, then initiate a climb at 60kn, when passing through 200ft altitude the climb speed can be reduced to 55 Kn (Vy).

5. CLIMB
6. THROTTLE - CHECK: completely open 100% or 115%. (5300 r.p.m. at 100%, 5500 r.p.m. at 115%)
7. SPEED – 60 Kn



NOTE:

See APPENDIX 2 for more information on speed and rates of climb.

8. TRIM - apply trim appropriate for level flight.



NOTE:

OPERATIONS TO EXECUTE THE TRIMMING

Keep the trim necessary to reach the desired speed by pulling up the control stick with a constant effort. Operate the trim switch (8) to pull up (backward) until reducing the load on the control stick.



NOTE:

If the trimming operation is done after the first takeoff or if it is done with the trim not engaged (12, green light), several seconds of pulling up are necessary before the trim control becomes efficient.

Once you feel that the load on the control stick has been reduced, as is necessary, reduce the grip on the control stick as much as necessary and keep a constant speed.



NOTE:

TRIM BACKWARD CONTROL = pull up trim = reduce speed

TRIM FORWARD CONTROL = push down trim = increase speed

Operate the trim switch with small impulses to pull up or push down until reaching and stabilizing the desired speed. Carefully release the control stick to check if the speed is maintained correctly.



NOTE:

The trimming operations may start during the climb after take off.



NOTE:

Always wait a few seconds after giving an input to the trim switch. This allows correct trimming and avoids too many trim variations so that the gyroplane may stabilize. Furthermore, check the flight speed.

9. OPERATIONS upon reaching a safe altitude (500 ft).
 - A) brakes - momentarily apply them to stop the rotation of the wheels.
 - B) power reduction - if there is no obstacle, reduce power for the first time.
10. LEVELLING - reduce the engine speed as necessary for level flying, prior to 50 ft the levelling altitude, and correct a possible speed variation with the control stick.
11. CRUISING - Set the engine speed necessary to maintain the desired flight level. Adjust the attitude with small corrections of the trim so as to maintain the desired speed. Check all the flight parameters and make sure not to exceed the specified values.

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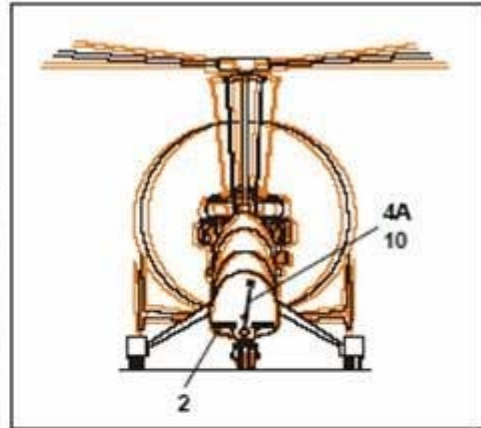
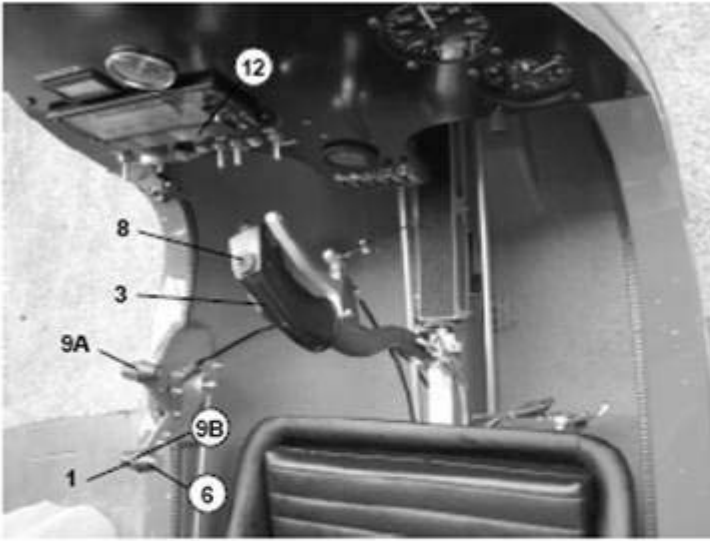
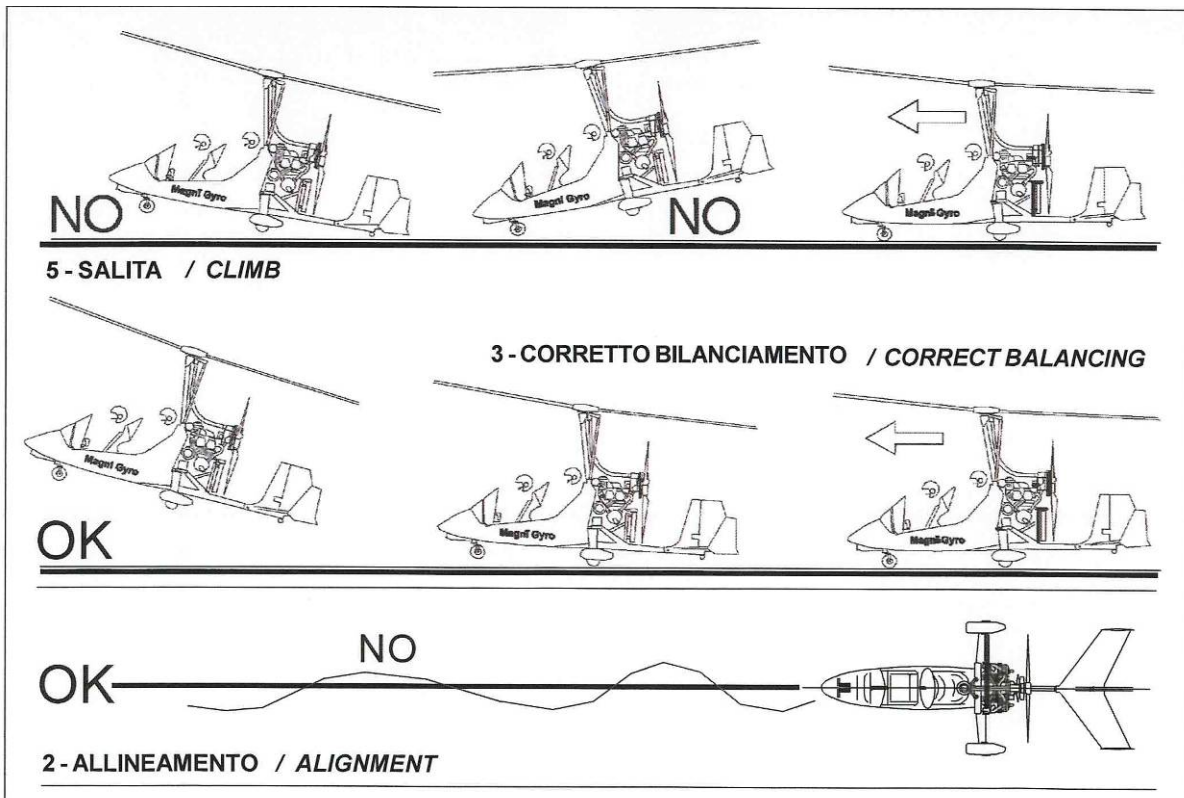
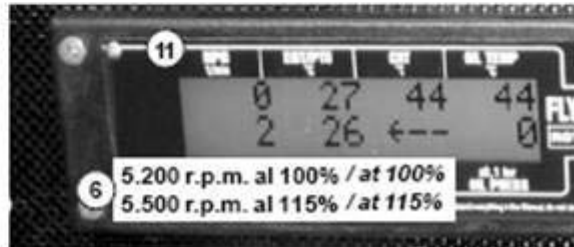
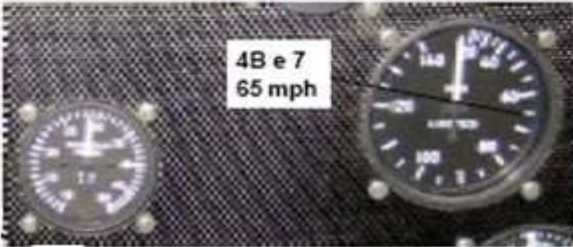
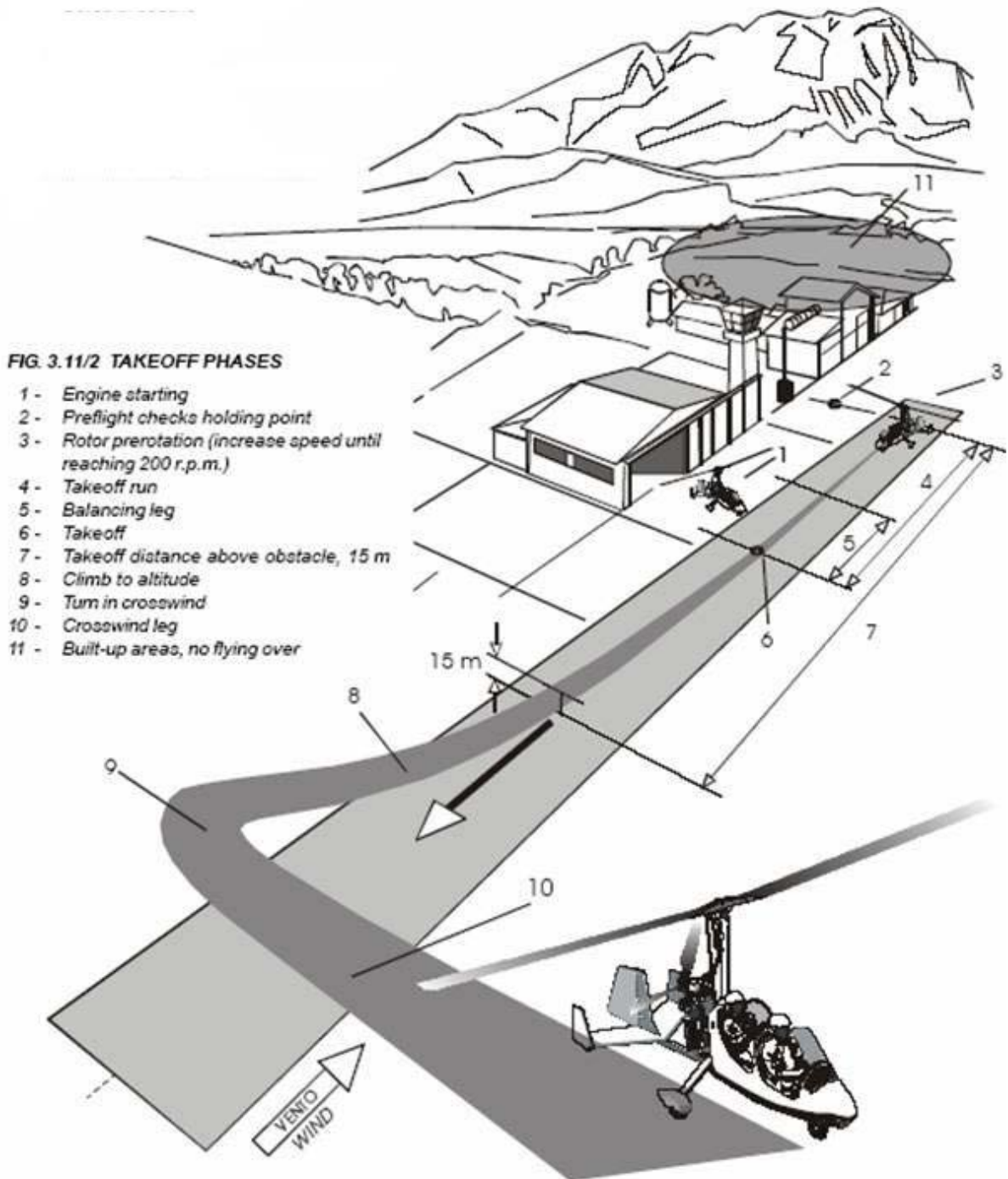


FIG. 3.11/1 DECOLLO
TAKEOFF





3.11.1 TAKE-OFF WITH CROSS WIND

During takeoff with cross wind, pay attention to keep the alignment with the runway. The take-off procedure with cross wind is identical to the procedure without wind. It is only necessary to use the rudder pedals and control stick conventionally.

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NOTE:



Normally, when taking-off with cross wind, as compared to a no-wind condition, the pedal should be used to keep the aircraft straight whilst applying into wind control stick. The degree of control inputs will be proportional to the wind's strength and speed and should be appropriate to keep the gyroplane aligned with the runway axis.



WARNING DANGER:

Maximum cross-wind component for take-off is 25kts

3.12 LANDING

Power Idling
Speed 55 kn

Maintain alignment with runway with rudder pedals and control stick.

At 2-3 meters from ground - first flare gently to reduce the glide path with a slight reduction of speed. Continue to progressive flare to level in ground effect.

In ground effect, continue the flare until the main wheels touch the ground.

To stop the gyroplane **upon contact with the ground**, progressively move the control stick to rear limit stop.

Use the rudder pedals to control the gyroplane's direction.

3.12.1 LANDING WITH CROSSWIND

The procedure for landing with crosswind is identical to that of normal landing.

The alignment with the runway must be maintained with rudder and into wind control stick.



WARNING DANGER:

Maximum cross-wind component for landing is 25kts

3.12.2 AFTER LANDING

Gyroplane stopped Control stick in front limit stop position.

Using the rudder pedals, **clear the runway** by moving the gyroplane towards the available turn-in/off taxi.

Stop the gyroplane with the brakes and apply parking brake.

TRIM - disengage the electric trim (switch forward) – green light ON.

Control lock -insert the control lock.

Rotor at 100 r.p.m. - operate rotor brake, brake warning light ON.

Align rotor fore and aft.

WARNING DANGER:



In presence of obstacles or people, or if the space is not adequate, operate the rotor brake before the rotor reaches 100 rpm. This will limit the rotor's arrest time as much as possible and guarantee maximum safety during operation.

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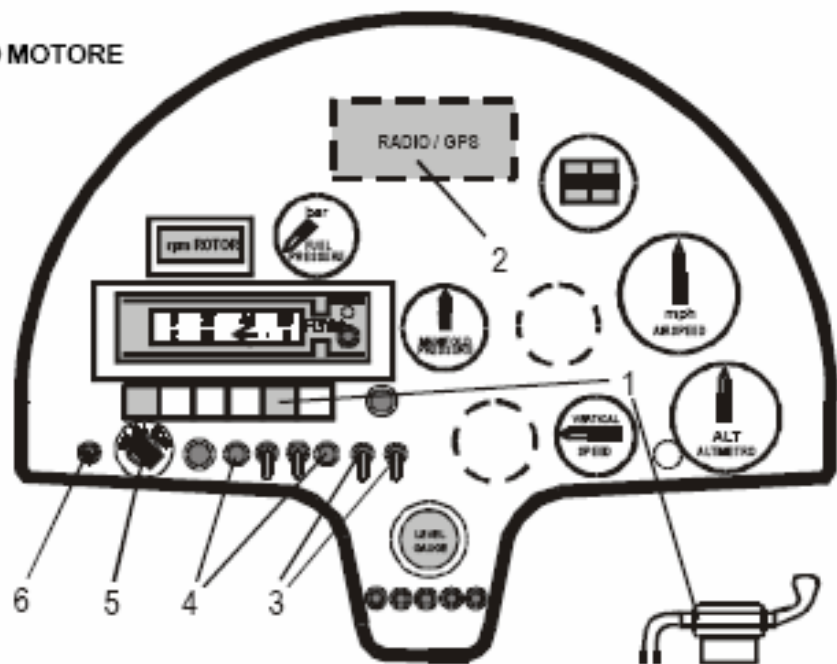
WARNING:

Start towards parking area.

First stop the rotor. Only then drive slowly towards the appropriate parking area.

3.12.3 ENGINE STOP

FIG. 3.13/6 SPEGNIMENTO MOTORE
ENGINE STOP



NOTE:

To stop the engine, the operations done on the instrument panel must be done from right to left.

With gyroplane braked and in parking position.

1. **ROTOR BRAKE** - ON lever up and BRAKE warning light ON
2. **RADIO** and navigation instruments – OFF
3. **STROBE and LIGHTS** – OFF
4. **FUEL PUMPS** – OFF
5. **KEYS** – OFF
6. **MASTER AVIONICS** – OFF

3.12.4 BEFORE LEAVING THE GYROPLANE

Post-flight inspection - check for possible damages, possible impacts with foreign matters, leaks or loss of fluids.

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3.13 UNUSUAL MANOEUVRES

3.13.1 SLOW FLIGHT AND FLIGHT BEHIND THE POWER CURVE

Purpose **Reduce** speed until reaching desired rating conditions 55 Kn -> 35 Kn

Preparation Constant **direction**
Level flight over 500 ft - 55 Kn

Execution **Reduce** engine
Check trim

Upon reaching 35 Kn:
Increase power to maintain altitude

To regain speed:
Change trim to increase speed
Check power until reaching 55 kn

3.13.2 VERTICAL DESCENT

To descend vertically at zero forward speed, follow these indications:

1. **Preparation:**
 - a. note wind velocity
 - b. safe height
2. **Throttle lever:**
Partial reduction in comparison with level flight values
3. **Trim management:**
 - a. pull up gently
 - b. reduce forward speed
4. **Directionality:**
Keep aligned with a reference on the horizon
5. **Reaching zero speed:**
Do not exaggerate nose-up trim
6. **Recovery:**
 - a. release the control stick forward
 - b. gradually bring back the power to level flight values
 - c. keep aligned with a reference on the horizon



WARNING DANGER:

Low speed manoeuvre with tail wind should be avoided. Low speed manoeuvres are only allowed at a minimum height of 500 ft. Engine failure whilst flying at low speeds and heights less than 500 ft may prove fatal for the occupants. See APPENDIX 3 for Height-Speed Envelope.



WARNING:

We recommend execution of gentle and progressive pitch movements in order not to incur excessive nose up pitch attitudes and obtain a more efficient recovery, whilst minimising height loss.

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SECTION 4

4 EMERGENCY PROCEDURES

4.1 GENERAL

This section contains the procedures to follow in case of emergency.

It is extremely important to know these procedures so as to be able to manage any emergency situation and apply the appropriate remedies, thus resolving the situation in maximum safety conditions.

Multiple emergencies, unfavourable weather conditions and particular conditions require specific modifications of the following procedures.

To end an emergency in the best possible way, the decision taken by the pilot must be rational and follow common sense logic.

4.2 CRITICAL EMERGENCY PROCEDURES

The emergency procedures may be classified in critical and non-critical ones.

Critical emergencies are defined as emergency situations that can appear in many variants, which need a quick and immediate action that must be instinctive, without reference to any checklist and gained by the pilot through training.

4.3 GROUND EMERGENCY PROCEDURES

FIRE DURING STARTING

FUEL PUMPS – OFF
THROTTLE LEVER - OPEN (to burn the fuel from fuel lines)
KEY - upon stopping the engine – OFF
MASTER – OFF
ABANDON THE GYROPLANE

4.4 EMERGENCY PROCEDURES DURING TAKEOFF

If an emergency occurs during takeoff, the pilot must decide whether to continue the takeoff or abort it.

His decision might be influenced by the nature of the malfunction, by the speed, by the point of takeoff when the malfunction was recognized, by the pilot's training to land or continue with the takeoff.

4.5 FIRE ON GROUND

Turn off engine magneto switches, flick Master switch to “OFF” and abandon the aircraft. Make call to emergency services.

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4.6 FIRE IN FLIGHT

If engine fire:

- a) Turn off engine magneto switches, turn off fuel pumps, make emergency landing, flick Master switch to "OFF" and abandon the aircraft. Make call to emergency services.

If electrical fire:

- b) If smoke/fire appears to be originating from instrument panel area, switch off non-essential equipment (and pull circuit breakers) and carry out precautionary landing. If smoke persists carry out actions in c) below.
- c) If smoke/fire appears to be originating from the engine area, turn off engine magneto switches, flick Master switch to 'OFF', make emergency landing and abandon aircraft. Make call to emergency service

4.7 ENGINE FAILURE

In case of failure of the engine the following actions are recommended:

Taxing, prior to take-off

Maintain directional control, brake and stop where safe.

Immediately after take-off

Land immediately ahead.

- a) If higher than 300ft - consider wind speed and direction. Select a forced landing site, in to wind and/or up any slope.
- b) If at, or above 350 feet height – consider flying a shallow turn, depending upon wind speed and direction, if necessary land downwind.

In flight

If at reasonable altitude

- a) Check magneto switch is set to "both"
- b) Check fuel pumps are on
- c) Check fuel gauge to confirm sufficient fuel
- d) Check choke is off
- e) Attempt engine re-start

If engine fails to re-start

- f) Turn off engine magneto switches
- g) Flick Master switch to "OFF"
- h) Check Harnesses are tight
- i) Consider wind speed and direction.
- j) Select a forced landing site, in to wind and/or up any slope

4.8 ENGINE START IN FLIGHT

The engine should not be deliberately stopped in flight except as part of forced landing training under the supervision of a competent instructor.

Where practical, to limit engine damage, leave the engine to idle at 3000 rpm for about 30 sec to cool before turning it off.

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The engine can be restarted in flight using the usual starting procedure.



NOTE:

To restart the engine the key must be turned completely to off, and then back to start

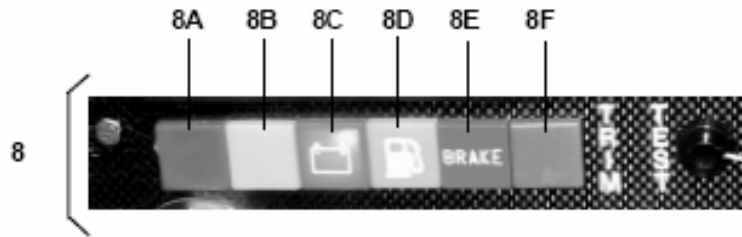
4.9 ABANDONING THE AIRCRAFT

In normal circumstances occupants should not leave the aircraft while either the propeller or the rotors are turning to prevent risk of the occupants being struck by moving blades.

If abandoning the aircraft in an emergency the pilot should turn off the engine magneto switches and flick the Master switch to "OFF".

If abandoning the aircraft with either the propeller and/or the rotors turning the occupants should follow a path out of the cockpit straight forward away from the nose of the aircraft, to minimise the risk of injury.

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ID	LIGHT TYPE	WARNING when the light is "on"	DESCRIPTION	ACTION TO BE TAKEN
8A	RED	DANGER	Supplying pressure parameter in excess	Reduce power to ensure engine is within normal operating limits. Land as soon as practicable. Contact an authorized service centre to eliminate the problem.
8B	ORANGE	WARNING	One of the sensors gives a wrong reading or is not functioning	Land as soon as possible and proceed to the nearest authorized service centre to solve the problem
8C	BATTERY	Missing Battery Re-loading	The battery loading system is not functioning	If "on" during the normal motor functioning, land as soon as possible and stop flying. Get in touch with an authorized service centre to eliminate the problem
8D	LOW FUEL	Low Fuel Level	The fuel level is low	Land in 5 minutes to avoid the shut down of the engine because of lack of fuel
8E	BRAKE	Rotor Brake Engaged	The lever of the brake rotor is in "on" position and consequently the rotor parking	Keep the rotor brake engaged during the taxing and parking operations. Disengage the rotor brake before driving the strip and the beginning of the operations
8F	GREEN TRIM	Trim Disengaged	Trim nose down end stroke	

WARNING DANGER:



A continuously illuminated red warning light indicates that the maximum admissible boost pressure has been exceeded. Engine speed and boost pressure should be reduced manually to be within normal operating limits. Flying should be ended as soon as possible as boost pressure control will either be limited or non existent.

A blinking red warning light indicates that the maximum 'take-off' time limitation has been exceeded. Engine speed and boost pressure should be reduced to at least maximum continuous limits.

A blinking orange light indicates a failure of a sensor, sensor wiring, TCU or leakage in the airbox. Engine speed and boost pressure should be reduced manually to be within normal operating limits. Flying should be ended as soon as possible as boost pressure control will either be limited or non existent.

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SECTION 5

5 OPERATION LIMITS

5.1 INTRODUCTION

This section contains and describes the operation limits to observe when using the gyroplane.



WARNING DANGER:

Should one of the limits specified in the present section be exceeded, all the parts of the gyroplane will have to be carefully overhauled and checked. This event must be notified in the flight logbooks. Before flying again, make sure that all the necessary checks have been done.

5.2 MINIMUM CREW

Any flying activity needs a crew of at least one pilot.



NOTE:

Smoking is forbidden.

5.3 LIMITATIONS OF POWER

The ROTAX 914 engine gives a maximum power of 115 hp for 5 minutes and 100 hp continuously for a maximum value of 5800 r.p.m. The relation between r.p.m. and manifold pressure is described in the document "**engine performance chart**" in the APPENDIX 5

5.4 ENGINE RUNAWAY

The maximum engine's rotation speed is **5800 rpm** In case of runaway speed, operate as follows:

From 5800 up to 6000 rpm.

Find the cause of the problem and solve it.

Over 6000 rpm.

Inspect the engine in accordance with the manufacturer's indications.



WARNING DANGER:

As the gyroplane is equipped with a ground adjustable pitch propeller, the runaway may occur because the pitch is not set correctly.

The standard pitch is set in the workshop and may not be optimum for every condition of use of gyroplanes (see "high altitude flight"). The pitch angles however may not be altered as the performance of the gyroplane may be severely reduced.

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Fig 5/1 Operation Limits





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Several reference parameters are given below in order to be able to correct the propeller's pitch if needed.

Climbing flight 55 Kn

Throttle lever at 100% 5100 - 5300 rpm

Climbing flight 55 Kn

Throttle lever at 115% 5400 - 5600 rpm



WARNING:

For such r.p.m. values it is possible to exceed the maximum speed limits in level flight with throttle lever at 115%.

To avoid the reduction of the acceleration during takeoff do not use higher pitches.

	Operating Temperatures		
	Min	normal	Max
OIL	50	90-110	130
CHT	50	90-110	135
EGT		750-850	950
Max Engine Rpm			5800
Consumption/hour			16-20 litres

5.5 SPEED LIMITS

Never exceed speed (VNE) 87 Kn

This speed must never be exceeded in order not to stress the gyroplane beyond its structural limits. This speed is indicated by a red mark on the air-speed indicator.

Normal operative speed (VNO) 78 Kn

This speed is the highest permitted in any turbulence condition (green range in the air-speed indicator).

5.6 FLIGHT MANOEUVRES LIMITATIONS

- Any flight manoeuvre with constant load lower than **1g** is prohibited as this will unload the rotor and cause degradation in handling qualities and structural strength margins.
- Any manoeuvre with a load lower than, or equal to **zero g** is prohibited.
- Any acrobatic manoeuvre is prohibited.

Please see the APPENDIX 4 for the flight manoeuvres limitations chart

5.7 LOAD FACTOR LIMITATIONS

Considering a flight configuration of 500 kg, the maximum value of normal bearable acceleration is equal to + 3 g. A higher value will permanently deform the gyroplane's structure.

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Flight configuration load factor

500 kg + 3 g

5.8 HEIGHT-VELOCITY ENVELOPE

Please see the APPENDIX 3 for the height-velocity chart.

5.9 C OF G LIMITATIONS

In order to avoid shifting of the centre of gravity beyond the front and rear limits, the gyroplane's loading limits are as follows:

- Minimum pilot weight 60 kg
- Maximum pilot weight 120 kg
- Minimum passenger weight 60 kg
- Maximum passenger weight 120 kg

Also see APPENDIX 1



WARNING DANGER:

Flying without pilot in the front seat is prohibited.



NOTE:

Keep in mind that the weight of either, the passenger or fuel, do not influence significantly the variation of the centre of gravity, as they remain in centre of gravity position.

5.10 LOAD LIMITATIONS

Maximum weight allowed during takeoff 500 kg
Maximum weight allowed during landing 500 kg

5.11 FLIGHT LIMITS

Flight restricted to VMC.

5.12 EXTERNAL LOADS



WARNING DANGER:

Applying loads or luggage on the outside of the fuselage is forbidden.

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5.13 TAKEOFF AND LANDING LIMITATIONS

The maximum crosswind component allowed for takeoff and landing operations is 25 kts.



NOTE:

Technique for take-off on rough grass is to spin up to a higher rotor rpm than usual to be able to accelerate at max continuous power until balancing on main wheels. Then apply max take-off power to clear the grass as soon as possible. Aircraft should then be accelerated to 55-60Kn then climb as normal.

5.14 ROTOR rpm MAX LIMIT

Max Rotor rpm 550 rpm

5.15 ALTITUDE LIMIT

Maximum altitude limited to 10000ft.

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SECTION 6

6 FLIGHT CHARACTERISTICS

6.1 GENERAL FLIGHT CHARACTERISTICS

The flight characteristics of this gyroplane are such that they generally allow pleasure, work and sport activities, but not acrobatics.

6.2 FLIGHT CONTROLS

The flight controls are of traditional type and operate on three axes (longitudinal, transversal and vertical). In any flight configuration and condition, only small efforts are necessary to manage the gyroplane in flight. The roll and pitch movements are obtained through the control stick, through moving the rotor head and thus the rotor disk.

The yawing movement is obtained through the rudder pedals which operate the rudder.

6.3 FLIGHT CHARACTERISTICS IN LEVEL CONDITIONS

6.3.1 LOW SPEED

The flight characteristics and manoeuvrability at low speed are excellent.



In any flight configuration, the roll and pitch controls are efficient until FWD speed zero.

In any flight configuration, the yawing control is fully efficient until falling below the speed of 20 Kn. It is also fully efficient until reaching speed zero, but only if the engine's speed is above 3000 r.p.m.

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6.3.2 HIGH SPEED AND CRUISING SPEED

The gyroplane is easy to control and manoeuvre at any flying speed. Its stability is excellent on all three axes.

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SECTION 7

7 FLIGHT IN ADVERSE CONDITIONS

7.1 INTRODUCTION

The procedures to follow when flying in adverse conditions are described in the present chapter.

7.2 TURBULENCE OR STORMS

WARNING DANGER:



It is forbidden to fly during a storm or turbulence. Should a storm occur during a flight, change route or look for a suitable place to land.

In case of strong turbulence, proceed as indicated below:

1. **Altitude** - In case of strong downdraught, keep such an altitude as not to impact on the ground or on other obstacles. When flying in mountains, flying at an altitude above the highest mountain crests should reduce turbulences and increase the intensity of steady wind (constant).
2. **Indicated speed** - adjust the trim in order maintain the best gust penetration speed.



...a forced landing is preferable...

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7.3 SNOW, ICE, RAIN

The gyroplane is not fitted with anti-icing systems for the control surfaces of both propeller and rotor.



WARNING DANGER:

It is forbidden to fly whenever there is a possibility of ice formation on aerodynamic surfaces. It is forbidden to fly in snow conditions. It is forbidden to fly in hail conditions.



WARNING:

Flying in rain conditions is permitted only if the visibility is sufficient to guarantee safe flying.



NOTE:

Extended flying in heavy rain conditions may cause the wear of the paint on the end of the rotor's and propeller's leading edges.



*...avoid useless attempts,
they are also forbidden...*

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7.3.1 EFFECTS OF SNOW, ICE AND RAIN DURING TAKEOFF



WARNING DANGER:

Any takeoff operation is prohibited in case the runway is covered with ice or snow or if it is flooded.



WARNING:

In case of rain, taking-off is possible only if the visibility is sufficient to guarantee a safe operation.

The taxiing operations are allowed on surfaces covered with ice or snow under the following conditions:

- a. increase of stoppage distance
- b. the control of ground directionability is less

7.3.2 EFFECTS OF SNOW, ICE AND RAIN DURING LANDING

Landing on a snowy, icy or wet runway requires maximum attention and care.

To reduce the speed and increase the resistance to the air, land with nose-up and keep the gyroplane flying as much as possible.

To completely brake the gyroplane, gently pull the control stick when the main wheels touch the runway. Gently continue the taxiing. Use the brakes gently and only when necessary.



...performance decreases with high temperature

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7.4 LOW AND HIGH TEMPERATURES

7.4.1 PROCEDURES UNDER LOW TEMPERATURE CONDITIONS

Starting the engine may be difficult in case of low temperature. Using the choke is always recommended. The use of external power supply units is allowed in case of difficult start due to low efficiency of the gyroplane battery.

7.4.2 PROCEDURES UNDER HIGH TEMPERATURE CONDITIONS

No special precaution is needed when using the gyroplane under high external temperature conditions. The following indications should be followed however

- a) Do not rest for too long during taxiing or in holding point.
- b) When using maximum power for long periods of time, check the temperature values of the heads and oil and make sure they do not exceed the maximum allowed values.
- c) After flying with nose-up trim and at slow speed, check the temperature values of the heads and oil and make sure they do not exceed the maximum allowed values.

NOTE:



High temperature conditions have negative effects on flight and climb characteristics, and on takeoff distances.

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APPENDICES

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APPENDIX 1

CG DATA

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Each aircraft is supplied with a weighing report from the factory detailing the empty weight and c.g. position of the gyroplane, when new. An example of which is shown below.

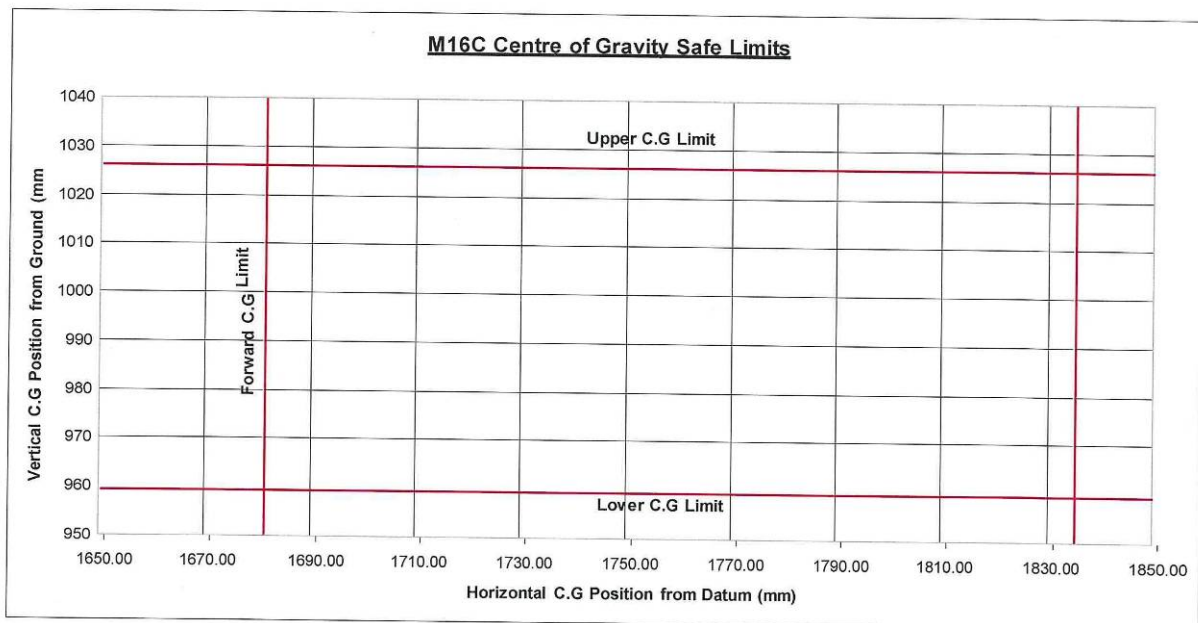
Aircraft Type	M16C	Aircraft Registration	G-EXPL	Date	18 th Mar 2009
WHEEL BASE		1800 mm			
MTOW	Normal:	500 kg	The Horizontal C.G. datum is defined as:		Fwd face of keel member
		The Vertical C.G. datum is defined as		Ground Level	
Level Aircraft Weighing Results					
Empty Weight at Starboard Main Wheel		Empty Weight at Port Main Wheel		Empty Weight at Nose Wheel	
136.7 kg		141.8 kg		4.3 kg	
Position from Datum: 2050 mm		Position from Datum: 2050 mm		Position from Datum: 250 mm	
Moment Arm: 280235 kgmm		Moment Arm: 290690 kgmm		Moment Arm: 1075 kgmm	
Empty Weight			282.8 kg		
Empty CG Position (Horizontal)		$CG = \frac{(\sum \text{Moment Arm})}{(\sum \text{Empty Weight})} = \frac{(280235 + 290690 + 1075)}{(136.7 + 141.8 + 4.3)}$		Empty CG Position (Horizontal)	
				2022.6 mm	
Inclined Aircraft Weighing Results					
Inclined Angle		6.75 degrees			
Empty Weight at Starboard Main Wheel		Empty Weight at Port Main Wheel		Empty Weight on Tail Wheel	
131.7 kg		135.6 kg		15.5 kg	
Empty CG Position (Vertical)		$z_{cg} = \frac{l_{nose} W_{nose} + l_{tail} W_{tail}}{W \tan \theta} = \frac{(1800 \times 4.3) + (1820 \times 15.5)}{(282.8 \tan 6.75^\circ)}$		Empty CG Position (Vertical)	
				1074.1 mm	
Fuel Tank Capacity			72 litres		
Weight of Full Fuel			52 kg		
Position from Datum	Horizontal	1695 mm	Moment Arm (Full Fuel):		88140 kgmm
	Vertical	787 mm	Moment Arm (Full Fuel):		40924 kgmm
Forward Seat					
Position from Datum	Horizontal	870 mm	Moment Arm with 60kg:		52200 kgmm
	Vertical	780 mm	Moment Arm with 60kg:		46800 kgmm
Position from Datum	Horizontal	870 mm	Moment Arm with 120kg:		104400 kgmm
	Vertical	780 mm	Moment Arm with 120kg:		93600 kgmm
Aft Seat					
Position from Datum	Horizontal	1695 mm	Moment Arm with 60kg:		101700 kgmm
	Vertical	891 mm	Moment Arm with 60kg:		53460 kgmm
Position from Datum	Horizontal	1695 mm	Moment Arm with 120kg:		203400 kgmm
	Vertical	891 mm	Moment Arm with 120kg:		106920 kgmm
Maximum Weight (Max Pilot 1, Min Pilot 2 & 42kg Fuel)			(283 + 120 + 55 + 42)		500 kg
Maximum Weight (Max Pilot only & Full Fuel)			(283 + 120 + 52)		455 kg
CG Position (each combination)		Max Possible Fuel		Zero Fuel	
		Horizontal	Vertical	Horizontal	Vertical
Fwd Seat 55kg / Aft Seat Zero / Full Fuel		1816.3 mm	994.3 mm	1835.0 mm	1026.2 mm
Fwd Seat 120kg / Aft Seat Zero / Full Fuel		1681.1 mm	963.6 mm	1679.3 mm	986.4 mm
Aft Seat 55kg / Fwd Seat 120kg / 42kg Fuel		1682.3 mm	959.2 mm	1681.1 mm	975.0 mm
Aft Seat 120kg / Fwd Seat 55kg / 42kg Fuel		1789.6 mm	973.6 mm	1798.3 mm	990.7 mm
This aircraft is/is not within the weight and CG requirements					
Signed:			Inspector No:		
Date:					

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The maximum extent of cg positions are defined in the following table and graph

CONDITION	MASS kg	THEORETICAL C.G.POSITION		NOTE
		X (mm) (Aft of Keel Beam Fwd,Face)	Z (mm) (Above Ground Plane)	
EMPTY	285	2022.6	1074.1	Zero fuel. Maximum Oil, coolant ,
MTOW & LOWEST CG	500	1682.3	959.2	Fwd 120kg pilot; Aft 55kg pilot plus 40kg fuel
MOST FWD CG	405	1679.3	986.4	One 120kg pilot in front seat plus zero fuel.
MOST AFT & HIGHEST CG	340	1835.0	1026.2	One 55kg pilot in front seat plus zero fuel



NOTE:



Conversion rate for fuel mass is 1 litre fuel = 0.72kg

Max permissible fuel loading is 500kg – aircraft empty weight – occupant weights.

Example Fuel Calculation:

500kg – 285kg (aircraft empty weight) – 85kg (pilot) – 90kg (rear seat occupant) = 40kg fuel

Fuel volume therefore = 40/0.72 = 55.5 litres

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APPENDIX 2

PERFORMANCE DATA

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SPEEDS

V _Y	Best Rate of Climb speed	55 Kn
V _{NE}	Never Exceed Speed	87 Kn
V _{MIN}	Min level flight speed	35 Kn
V _{APP}	Landing approach speed	55 Kn
V _{MC} Power Off	Min Control Speed - Power Off	20 Kn
V _{MC} Power On	Min Control Speed - Power On	20 Kn
V _{NO}	Normal Operating (Cruise) Speed	78 Kn

DISTANCES

Take off Distance to 50 ft	(Grass)	820 ft
Take off Distance to 50 ft	(Tarmac)	700 ft
Landing Distance from 50 ft		510 ft

CLIMB & GLIDE

Climb Rate	(MAUW)	625 ft/min
Glide Rate	(MAUW)	1050 ft/min
Glide Rate	(Min Weight)	950 ft/min

CROSS WIND

Maximum Demonstrated Cross-Wind Component for Take-Off	25 kts
Maximum Demonstrated Cross-Wind Component for Landing	25 kts

SERVICE CEILING

Maximum service ceiling 10,000ft

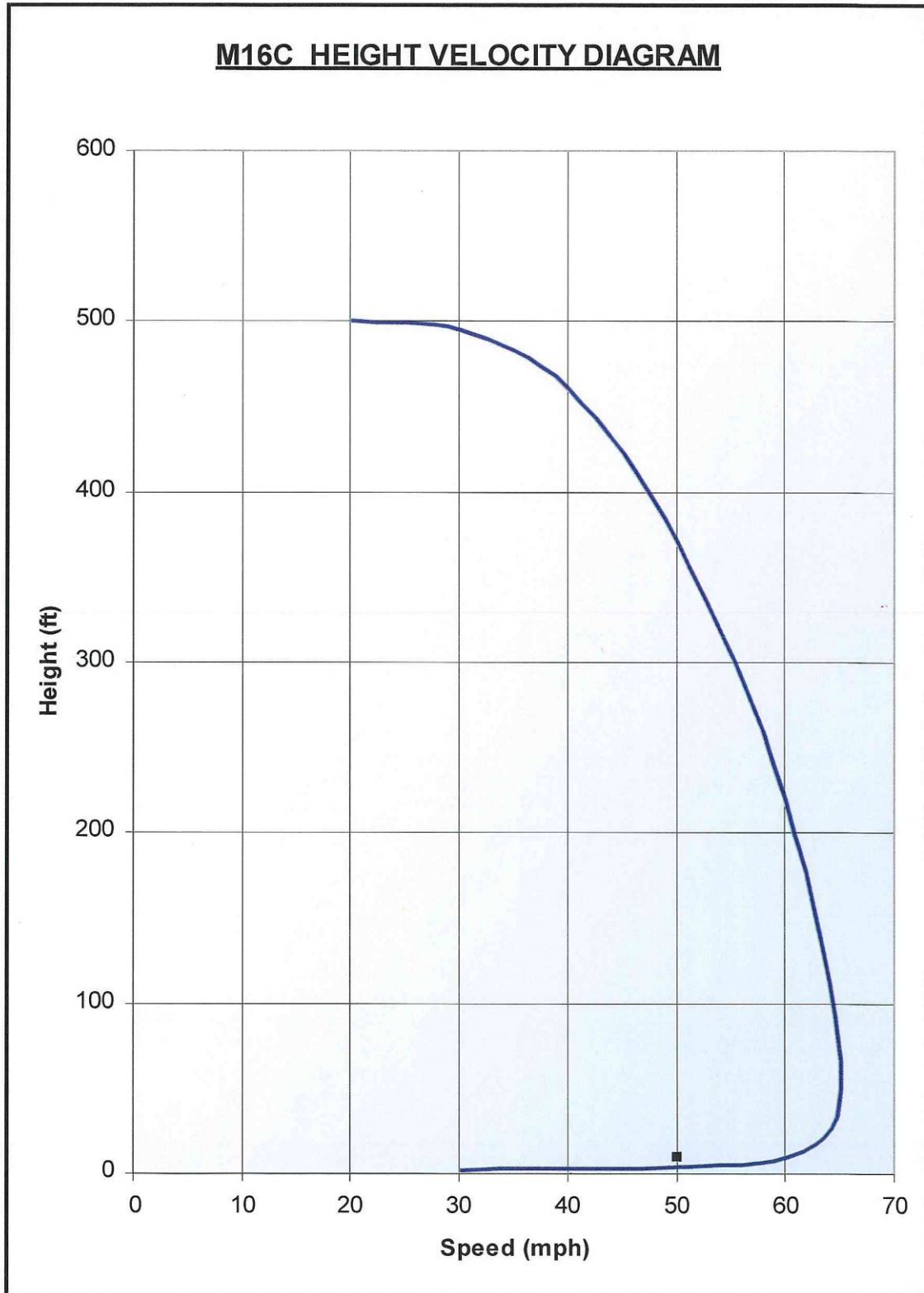
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APPENDIX 3

HEIGHT VELOCITY DIAGRAM

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APPENDIX 4

MANOEUVRE LIMITATIONS

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The aircraft shall be flown by day in visual meteorological conditions (VMC) only.

Flight in icing conditions is prohibited.

Flight in strong gusty winds or wind velocities of more than 40 kts is prohibited.

Intentional spinning is prohibited.

Aerobatic manoeuvres are prohibited.

Manoeuvres involving a deliberate reduction in normal 'g' shall be avoided.

Maximum bank angle 60 degrees from vertical.

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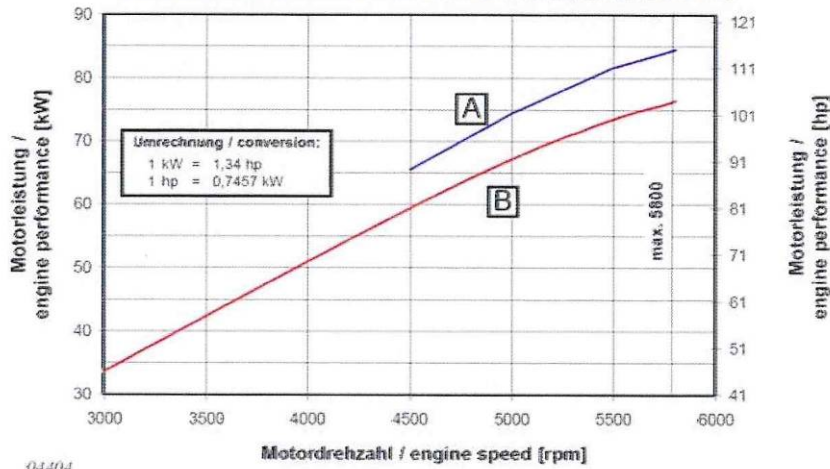
APPENDIX 5

ENGINE PARAMETERS

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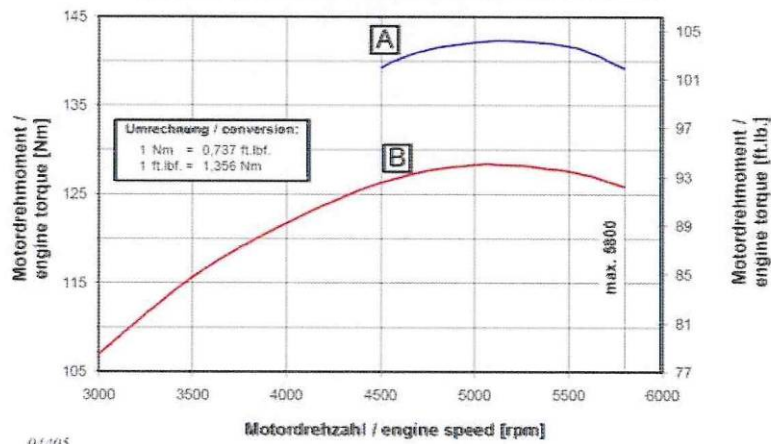


MOTORLEISTUNG / ENGINE PERFORMANCE



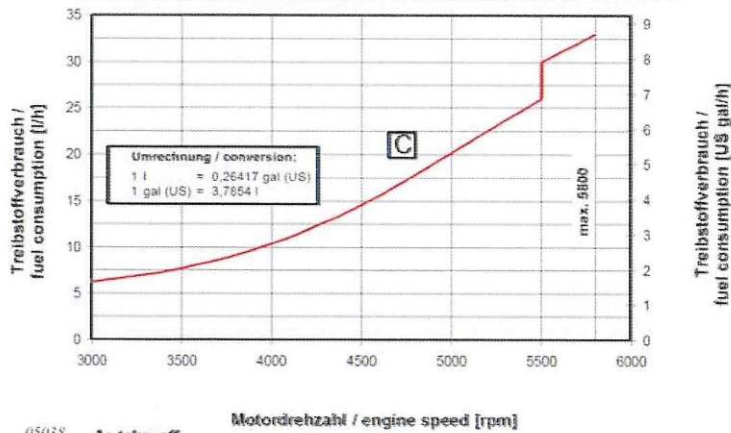
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MOTORDREHMOMENT/ ENGINE TORQUE



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TREIBSTOFFVERBRAUCH / FUEL CONSUMPTION

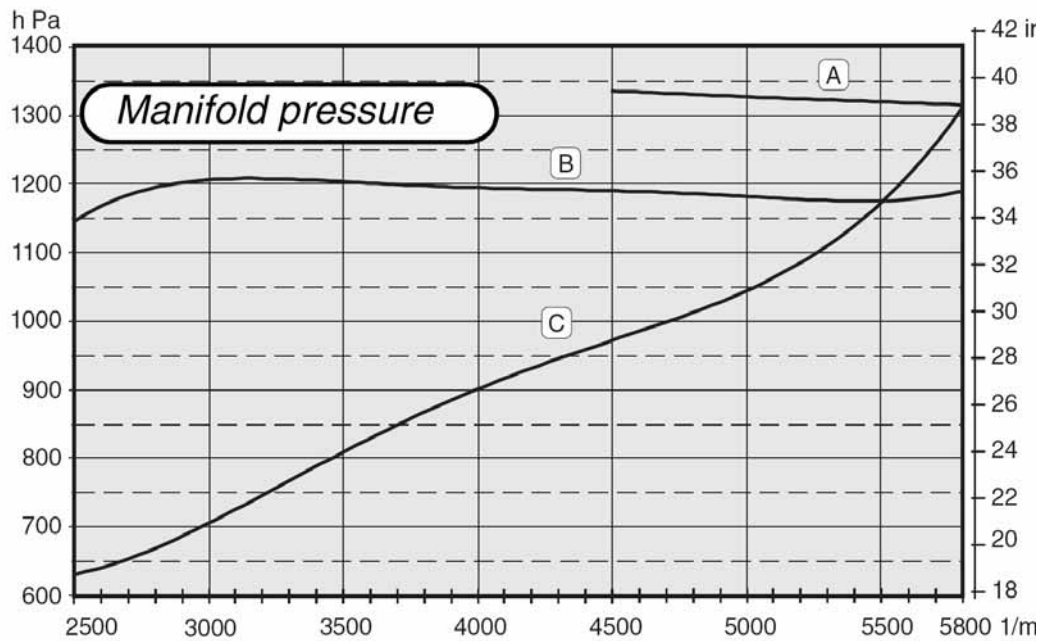


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- A: take off
- B: max continue
- C: propeller curve

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- A Take-Off Performance
- B Continuous Throttle Performance
- C Propeller Power Requirement



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