PILOT'S OPERATING HANDBOOK

CH77 RANABOT

This handbook includes material required by regulation to be furnished to the pilot and must be carried in the aircraft at all times.

Helicopter Serial Number

Helicopter Registration

PILOT’S OPERATING HANDBOOK CH-77 RANABOT

SECTION HEADINGS

SECTION 0 –GENERAL

CONTENTS SECTION 0

SECTION 0 – GENERAL

0.1 CORRESPONDENCE RELATING TO THIS MANUAL

For:

- Additional manuals (cost 5.00 € by cheque payable to CH7 HELISPORT S.r.l.).
- Technical information.
- Notifying errors or omissions in this handbook.

Please use a copy of this contact sheet and send along with your name and contact details to:

CH-7 HELISPORT S.r.l.
Strada Traforo Del Pino, 102
I – 10132 Torino To

SECTION 0 – GENERAL

0.2 GENERAL INFORMATION

This manual is designed as an operating guide for the pilot. It contains information required to be furnished by regulation as well as additional data supplied by the manufacturer. It is to be used in conjunction with the engine manuals published by Rotax as modified by EPAPOWER documentation and by the manuals pertaining to the EMS, radio and any other fitted equipment.

These manuals will be periodically updated. The most recent manuals published cancel and replace all previous versions and are effective from the date of publication. Service Bulletins, Safety Notices and Airworthiness Directives may also be periodically released and are also effective from the date of publication. It is the responsibility of the pilot to verify compliance with all the stipulations and recommendations contained in the latest documentation before each flight.

As required by the terms of Helisport Service Letter No.1 dated 12.02.2012, the proprietor, the operator and the pilot must be registered with the manufacturer via the website « www.ch-7helicopter.com » in order to obtain the above mentioned documentation.

It is the responsibility of the pilot to ensure the aircraft is airworthy and safe for flight.

An aircraft flight log must be kept and must as a minimum specify the date and duration of each flight and note the date and details of any anomalies encountered during inspections or during flight, of the addition oils or coolant, or generally of any operation performed on the aircraft. It is the responsibility of the pilot to maintain this log accurately. The log must be presented at each service in order to assist the mechanic correctly assess the condition of the aircraft.

It is the responsibility of the pilot to respect the limitations indicated on the instruments and placards and in this manual.

Given the difficulty in referring to a manual while flying a helicopter, the pilot should study the entire handbook and have become familiar with the limitations, performances, characteristics and operational procedures before flight.

This manual is divided into numbered sections. The limitations and emergency procedures appear at the beginning of the manual followed by normal operating procedures, performances, weight and balance, maintenance and other information.

SECTION 0 – GENERAL

0.3DESCRIPTIVE DATA

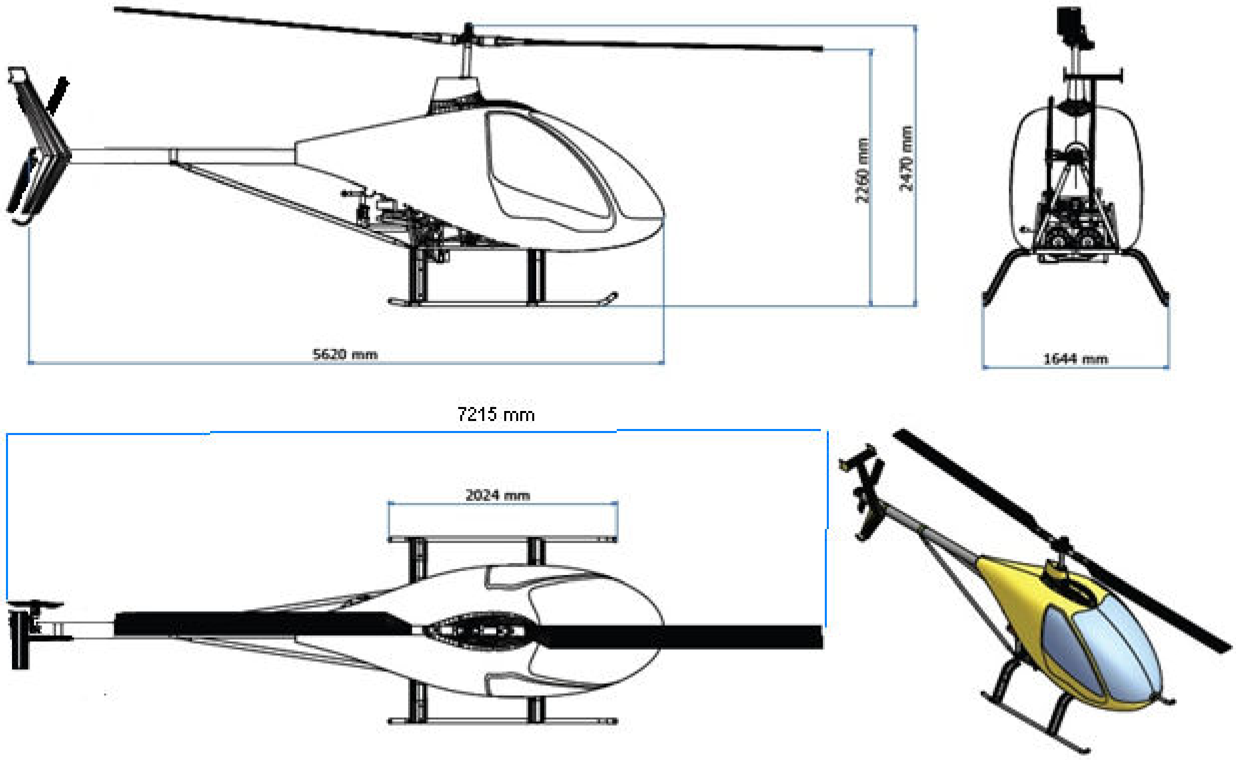
CH-77Ranabot:	Two-seat helicopter.
Structure:	Tubular steel welded chassis, composite body.
Main Rotor:	Two blade composite, teetering head.
Tail Rotor:	Two bade, metal.
Power plant:	EPAPOWER SA-R 914-1400 (based on Rotax 914). EPAPOWER SA-R 917-Ti.
Instruments:	Air speed indicator, altimeter, vertical speed indicator, compass, rotor and engine tachometer, manifold air pressure indicator, engine monitoring system.
Equipment:	Single engine coolant radiator coupled with engine oil heat exchanger, MGB oil radiator, 2 electric fuel pumps, governor, electric roll and pitch control trim, cockpit voice alarm and checklist system.
Landing Gear:	Two skids. Amphibious version equipped with floats.
Standard Empty Weight:	280 kg. Basic empty weight variable depending on builder and equipment. Refer to W&B record for individual aircraft.
Maximum Take Off Weight:	450 kg (Amphibious version 500 kg).
Fuel Tank Capacity:	66 litres.
Fuel consumption (70% of maximum power):	27.8 l/h (SA-R 917-Ti. 25. l/h)
Min fuel consumption in cruise:	17 l/h (SA-R 917-Ti. 15 l/h)
Useful load:	Variable depending on version (difference between the maximum take-off weight of the version and the actual empty weight of the individual aircraft).

SECTION 1 — DESCRIPTION

CONTENTS SECTION 1

SECTION 1 – DESCRIPTION

1.1 DRAWING AND DIMENSIONS



SECTION 1 – DESCRIPTION

1.2 CHARACTERISTICS

1.2.1 Main Rotor

Free to teeter and cone, rigid in plane.

Number of blades:	2
Diameter:	6.27 m
Blade chord:	19.4 cm
Blade twist:	6°
Tip speed (at 104 %):	189 m/s

1.2.2 Tail Rotor

Free to teeter, rigid in plane.

Number of blades:	2
Diameter:	1.08 m
Blade chord:	9.7 cm
Blade twist:	8°
Tip speed (at 104%):	176 m/s

1.2.3 Transmission

Engine to upper pulley wheel:	Multigroove V-belt.
Upper pulley wheel to drive line:	Sprag clutch.
Drive line to main rotor:	Spiral bevel gearbox.
Drive line to tail rotor:	Spiral bevel gearbox.

SECTION 1 – DESCRIPTION

1.2.4 Engine

Engine type:	EPAPOWERSA-R 914-1400 (based on Rotax 914). 4 stroke 4 cylinder horizontally opposed. Drive through reduction gearbox. 2 carburettors. Electronically controlled turbocharger. EPAPOWERSA-R 917Ti-. 4 stroke 4 cylinder horizontally opposed. Drive through reduction gearbox. Electronic Fuel Injection System. Electronically controlled turbocharger
Displacement:	1 400 cm^3
Maximum power output:	97.kW (130 hp) at 5800 rpm (106%) and 40” MAP. (not applicable)
Take-off power output:	94.7 kW (127 hp) at 5500 rpm (104%)and 40” MAP (5 mins max).
Continuous power output:	80.5 kW (108 hp) at 5500 rpm (104%)and 35.6” MAP.
Cooling:	Liquid and air.
Weight:	71.7 kg

ATTENTION: The EPAPOWER engine is based on the Rotax 914. The latest Rotax 914 manuals apply to the engine, except where specifically modified by EPAPOWER documentation published on the website “www.ch-7helicopter.com” or in this manual.

1.2.5 Fuel

Fuel:	Unleaded MOGAS not less than MON 85 or RON 95. Avgas 91 UL. Avgas 100 LL (with restrictions see section 2.10 fuel limitations).

SECTION 1 – DESCRIPTION

1.2.6 Lubricants and Coolant

Engine oil specification:	4 stroke engine oil with appropriate additives for reduction gearboxes. These oils should correspond to the API classification «SG» or higher. **Never** use aircraft engine oils without appropriate additives.
Recommended engine oil:	CH7 HELISPORT S.r.l. recommends Pakelo 900 100% synthetic .
Engine oil quantity:	3 litres .
Engine oil consumption:	0,80 litre/hour maximum.
Freewheel oil: Quantity:	MOBIL JET OIL or equivalent. 35 cm^3 (as per instructions in the kit assembly manual).
Main gearbox oil: Quantity:	SWEPCO 201 (SAE 90 ISO 220) or equivalent. 1.3 litres max (1.6 litres if cold).0.9 lt MGB after S/N 145
Tail gearbox oil: Quantity:	SWEPCO 201 (SAE 90 ISO 220) or equivalent. 40 $cm^{3.}$
Engine coolant:	Ethylene glycol. EVANS NPG+TM coolant is not to be used.
Recommended coolant:	CH7 HELISPORT S.r.l. recommend VWTLZ 774D/F (G12/G12+) mixed with water Rate 33%.
Quantity:	3.5 litres max.

1.2.7 Structure

Chassis:	4130 welded steel chassis pressurised with nitrogen gas.
Pressure:	2 bars.

SECTION 1 – DESCRIPTION

1.2.8 Abbreviations and Definitions

PERFORMANCE DEFINITIONS AND ABBREVIATIONS

IAS	Indicated Air Speed. Airspeed as indicated on the airspeed indicator.
CAS	Calibrated Air Speed. Airspeed as indicated on the airspeed indicator corrected for instrument error and position error.
TAS	True Air Speed. Airspeed relative to surrounding undisturbed air, equivalent to CAS corrected for pressure altitude and temperature.
V_{NE}	Never Exceed airspeed.
V_Y	Airspeed for the best rate of climb.
AMSL altitude	Height Above Mean Sea Level. Indicated by the altimeter (corrected for instrument and position error) when the barometric subscale is set to the atmospheric pressure currently existing at sea level.
Pressure Altitude	Altitude indicated by the altimeter (corrected for instrument and position error) when the barometric subscale is set to 1013.2 hPa.
Density Altitude	Altitude in ISA at which the air would have the same density as the air observed. Equivalent to Pressure Altitude corrected for temperature and humidity.
ISA	International Standard Atmosphere. Exists when the air pressure at sea level is 1013,2 hPa, and the temperature at sea level is 15°C and decreases by 1,98°C per 1000 feet of altitude.
AGL	Above Ground Level.
IGE	In Ground Effect.
OGE	Out of Ground Effect.
MAP	Manifold Air Pressure. Absolute pressure in the engine intake manifold.
RPM	Revolutions Per Minute. Speed of the engine or rotor. Shown on the tachometer as percentage for ease of appreciation.
MCP	Maximum Continuous Power.
TOP	Take Off Power (limited to 5 minutes duration).
MGB	Main Gear Box.
TGB	Tail rotor Gear Box.
ALT	Alternator.
EMS	Engine Monitoring System.
CAT	Carburettor Air Temperature.
CHT	Cylinder Head Temperature.
EGT	Exhaust Gas Temperature.
MPH	Statute Miles Per Hour.

1.2.8 Abbreviations and Definitions (cont)

WEIGHT AND BALANCE DEFINITIONS

Reference Datum	Imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	A longitudinal location along the helicopter fuselage measured from the reference datum.
Longitudinal Arm	Horizontal distance from the Reference Datum to the Centre of Gravity of an item.
Lateral Arm	Horizontal distance to the Centre of Gravity of the item measured from the vertical longitudinal plane passing through the mid-line between the two skids. A lateral arm towards the right of the aircraft is expressed as a positive value and a lateral arm towards the left of the aircraft is expressed as a negative value.
Moment	Product of the weight of an item multiplied by its arm.
Centre of Gravity (CoG)	The point at which the helicopter (or a constituent item) would balance if suspended.
CoG Arm	Distance from the CoG to the Reference Datum. May be calculated by dividing the total moment of the constituent items by the total weight of the helicopter.
CoG Limits	The maximum and minimum CoG arms between which the CoG must be found for a given total weight.
Usable Fuel	Fuel available for the engine in flight. (Total fuel on board less unusable fuel).
Unusable Fuel	Fuel remaining in the tanks after engine stops in run out test.
Standard Empty Weight:	Weight of a standard helicopter including Unusable Fuel and full lubricants and coolant.
Basic Empty Weight	Standard Empty Weight plus weight of installed optional equipment.
Take Off Gross Weight (TOGW)	Total weight of aircraft, including Load, at take-off.
Maximum Take Off Weight (MTOW)	Maximum permitted TOGW.
Load	Weight of occupants, baggage and Usable Fuel.
Useful Load	Difference between MTOW and Basic Empty Weight

SECTION 1 – DESCRIPTION

1.2.9 Conversion Tables

METRIC TO IMPERIAL:

MULTIPLY	BY	TO OBTAIN
centimetres (cm)	0.3937	inches (in)
kilograms (kg)	2.2046	pounds (lb)
kilometres (km)	0.5400	nautical miles (nm)
kilometres (km)	0.6214	statute miles (mi)
litres (l)	0.2642	US gallons (gal)
litres (l)	1.0567	US quarts (qt)
metres (m)	3.2808	feet (ft)
kilowatts (kW)	1.3410	horse power(hp)
degrees Celsius (°C)	$\frac{9}{5}C^{o}+32$	degrees Fahrenheit (°F)

IMPERIAL TO METRIC:

MULTIPLY	BY	TO OBTAIN
feet (ft)	0.3048	metres (m)
US gallons (gal)	3.785	litres (l)
inches (in)	2.540	centimetres (cm)
inches (in)	25.40	millimetres (mm)
nautical miles (nm)	1.852	kilometres (km)
pounds (lb)	0.4536	kilograms (kg)
US quarts (qt)	0.9464	litres (l)
statute miles (mi)	1.6093	kilometres (km)
horse power(hp)	0.7460	kilowatts (kW)
degrees Fahrenheit (°F)	$\frac{5}{9}\times(^{o}F-32)$	degrees Celsius (°C)

SECTION 1 – DESCRIPTION

1.2.10 Major Component Identification

COMPONENT OR ASSEMBLY	TYPE	P/N	S/N
Engine	SA-R		
Main gear box		CTP RB	
Tail gear box		CH709000A	
Main rotor hub		CH7070200	
Main rotor blade		PLX110K CSC1010ECH7	
Main rotor blade		PLX110K CSC1010ECH7	
Tail rotor blade		CH7101210/C	
Tail rotor blade		CH7101210/C	

1.2.11 Instruments

FLIGHT INSTRUMENTS	TYPE
Air Speed Indicator	20 mph – 180 mph
Altimeter	HPa: –1 000 ft / +20 000 ft
Vertical Speed indicator	± 2 000 ft/min
Compass	PAI 700
Hour Meter	LED 6 digits

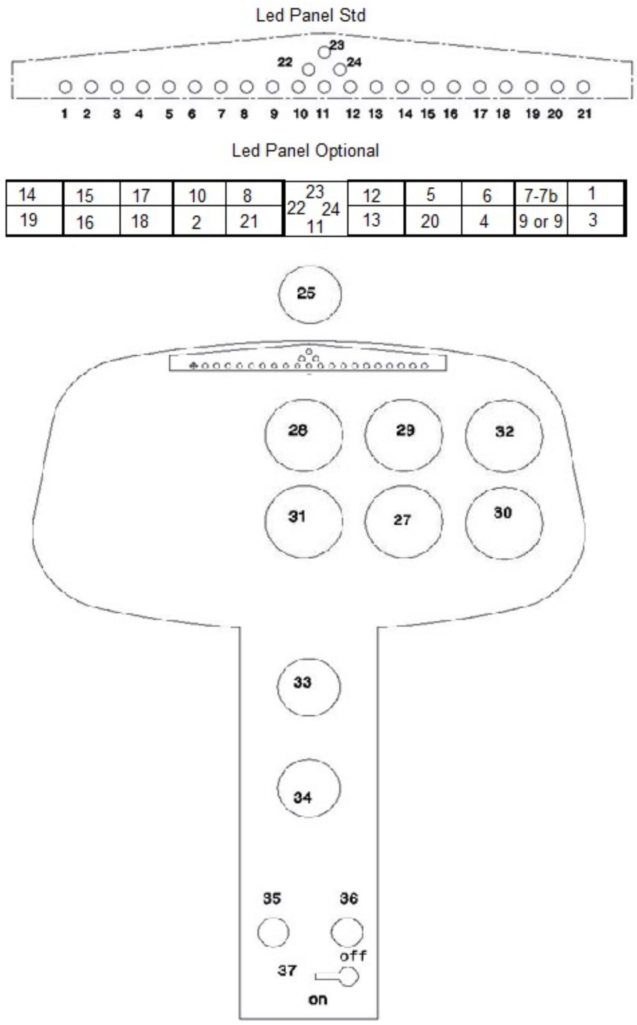
ENGINE INSTRUMENTS	TYPE
Engine Monitoring System	FlyBox mini EIS (version CH-77-frontend68)
Engine Monitoring System	Vigilus core 2.27
Engine Monitoring System	SA- D153 SA-C125 EPA Engine 917 Ti Only
Tachometer	3DA5-149KIT

AVIONICS	TYPE
Radio	
Transponder (as option)	

SECTION 1 – DESCRIPTION

1.2.12 Instrument Panel

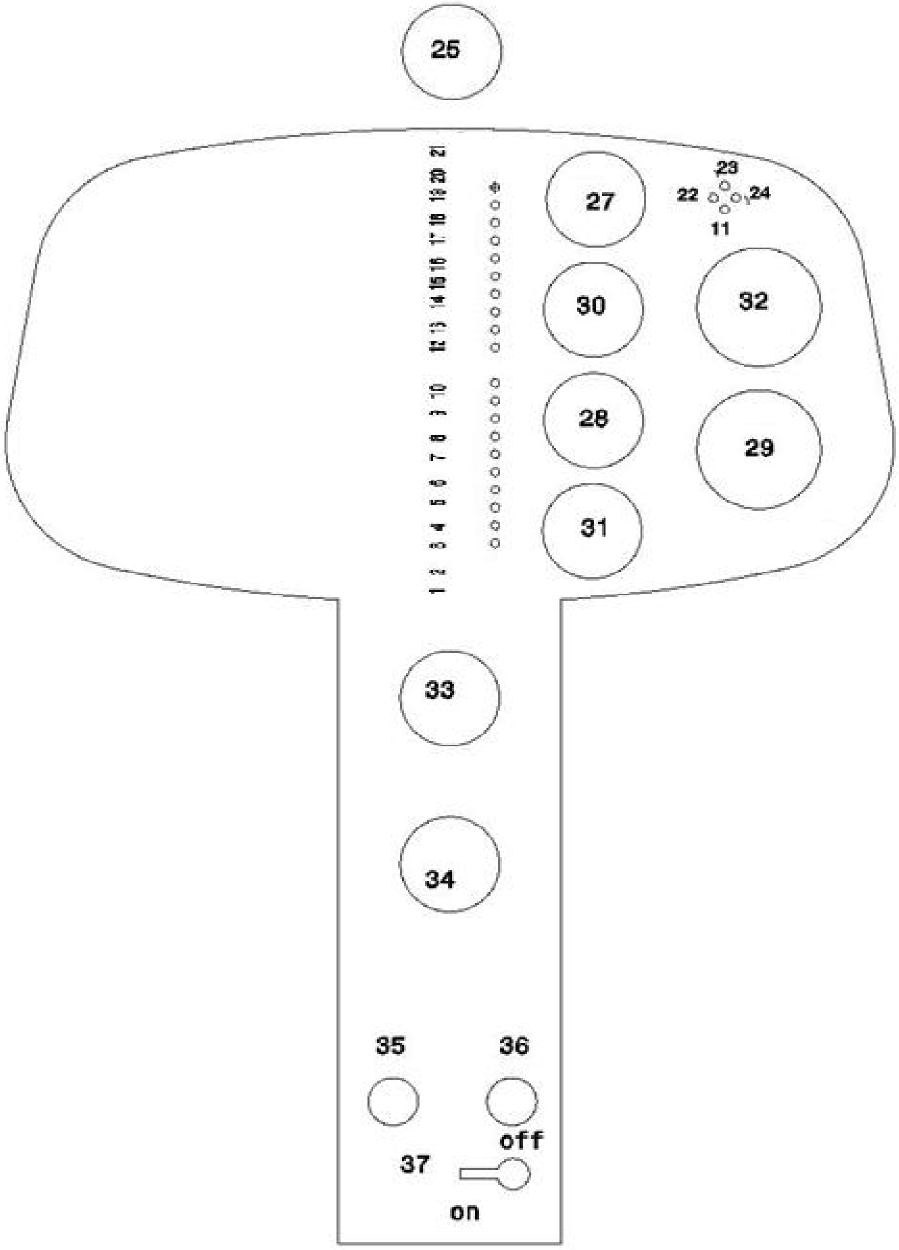
STANDARD.VERSIONS



SECTION 1 – DESCRIPTION

1.2.12Instrument Panel (cont)

LIGHT VERSION



SECTION 1 – DESCRIPTION

1.2.12Instrument Panel (cont)

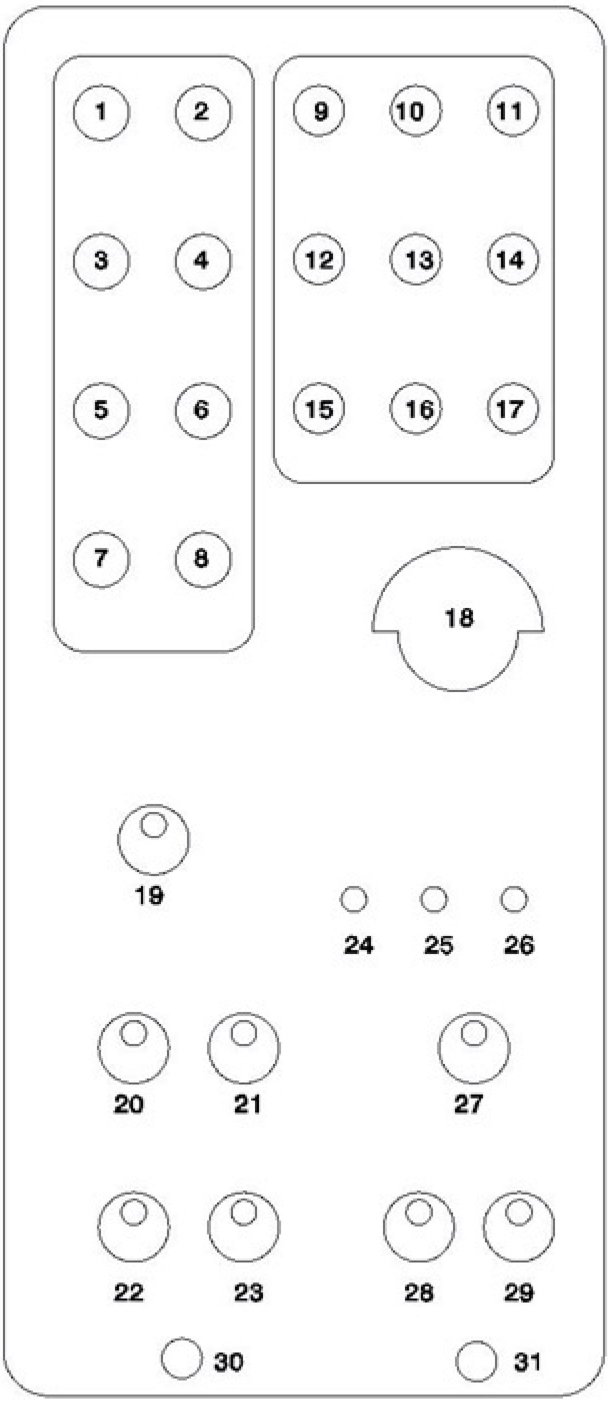
1	Low oil pressure warning light	red
2	Chassis pressure warning light	yellow
3	Low fuel level warning light	yellow
4	Integrated generator charge failure warning light	yellow
5	Auxiliary generator charge failure warning light	yellow
6	Turbo control unit anomaly warning light	yellow
7	Engine power reach limitation warning light	yellow
7b	Air Box Temperature extended warning blinking light	yellow
8	Engine Monitoring System alarm warning light	yellow
9	Low fuel pressure warning light	yellow
9	**T**urbo **W**arning Control **U**nit failure light(version SA-R917Ti)	red
10	Engine cooling fan alarm warning light	red
11	Pitch trim neutral indicator light	green
12	MGB chip alarm warning light	yellow
13	TGB chip alarm warning light	yellow
14	Indicator light not used	white
15	Landing light on indicator light	green
16	Navigation lights on indicator light	green
17	Engine cooling fan 1 on indicator light	green
18	Engine cooling fan 2 on indicator light	green
19	Defrost (if installed)	green
20	Governor off indicator light	white
21	Clutch motor operation light	yellow
22	Roll trim neutral indicator light	green
23	Forward full pitch trim applied indicator light	red
24	Right roll full trim applied indicator light	red

25 Compass
26 Free
27 Manifold air pressure gauge
28 Vertical speed indicator
29 EMS
30 Airspeed Indicator
31 Altimeter
32 Engine / rotor tachometer
33 Radio
34 Transponder
35 Cabin heat control
36 Cabin ventilation control
37 Fuel cock

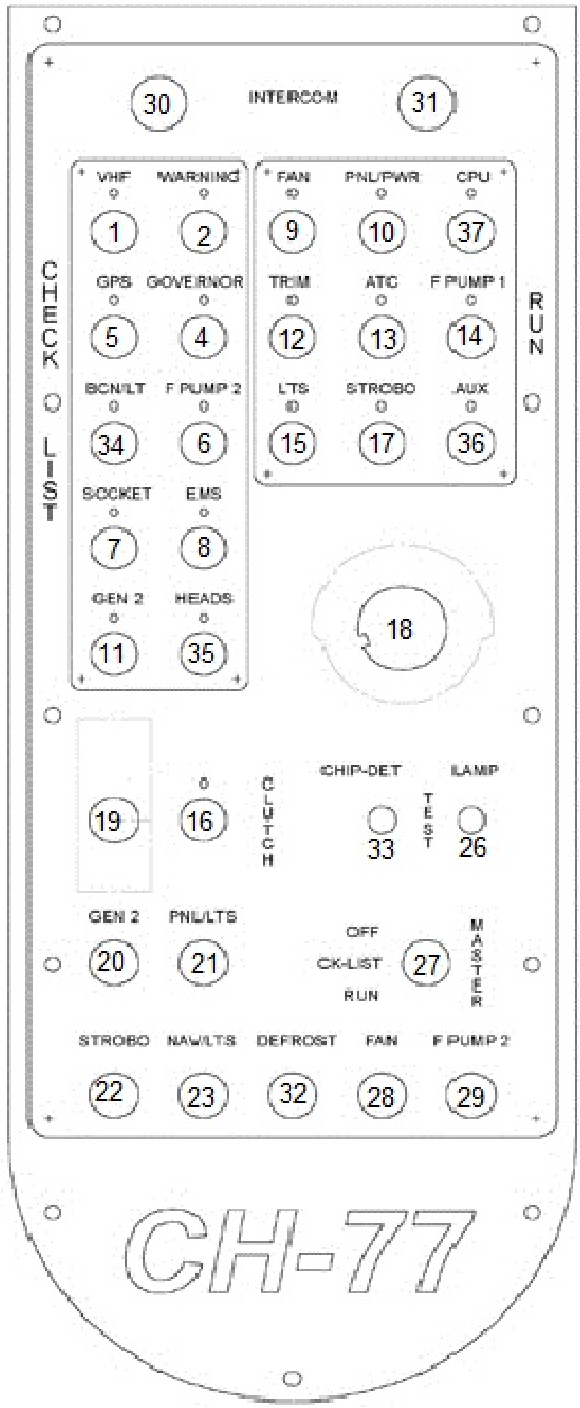
SECTION 1 – DESCRIPTION

1.2.13 Overhead Switch Panel

EPA SA-R 914



EPA SA-R 917 Ti



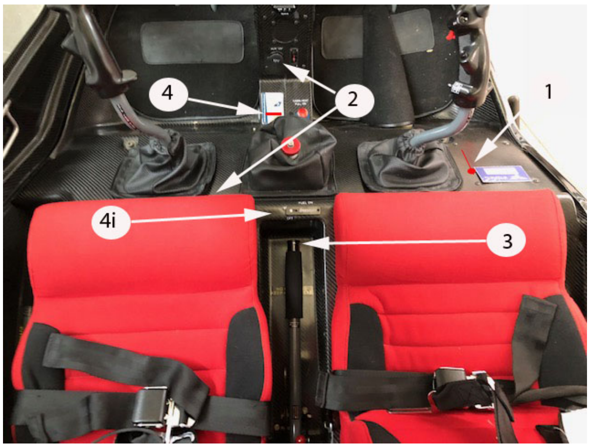
SECTION 1 – DESCRIPTION

1.2.13Overhead SwitchPanel (cont)

1	VHF circuit switch breaker	7.5A
2	Warning card circuit switch breaker	2 A
3	Turbo control unit circuit switch breaker	5 A
4	Governor circuit switch breaker	5 A
5	GPS circuit switch breaker	2 A
6	Fuel pump 2 circuit switch breaker	7.5 A
7	Socket power outlet circuit switch breaker	7.5 A
8	EMS circuit switch breaker	2 A
9	Engine cooling fan circuit breaker	2 A
10	Panel power relay circuit switch breaker	5 A
11	Auxiliary generator circuit switch breaker	3 A
12	Control trim circuit switch breaker	3 A
13	Transponder circuit switch breaker	7.5 A
14	Fuel pump 1 circuit switch breaker	7.5 A
15	Lighting circuit switch breaker	5 A
16	Clutch motor circuit switch breaker	2 A
17	Strobe-light circuit switch breaker	5 A
18	Ignition key	
19	Clutch switch	
20	Auxiliary generator switch	
21	Panel light switch	
22	Strobe switch	
23	Navigation lights switch	
24	MGB chip test button	
25	TGB chip test button	
26	Warning lights test button	
27	Master switch	
28	Engine cooling fans switch	
29	Fuel pump 2 switch	
30	Headset 2 jack socket	
31	Headset 1 jack socket	
32	Defrost switch	
33	MGB and TGB chip test button	
34	Red Beacon light switch breaker	3 A
35	Heads circuit switch breaker	1 A
36	Aux/Hook /Spray System	
37	Not used	

SECTION 1 – DESCRIPTION

1.2.14 Cabin Interior

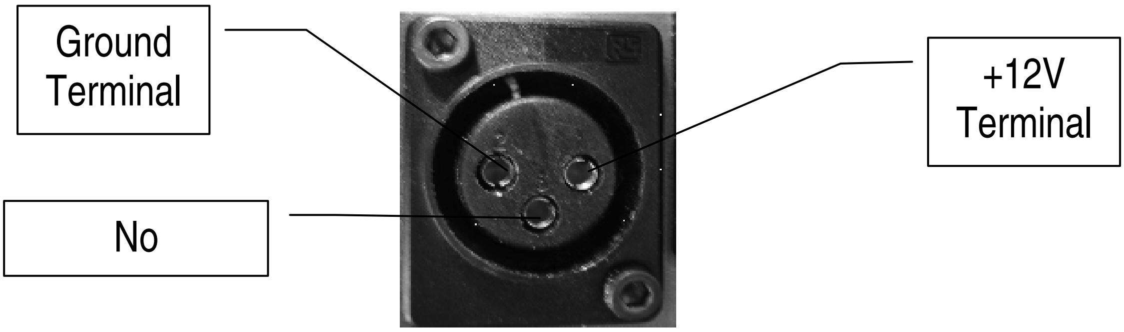


1 Choke
2 Accessory 12V power outlet
3* Starter motor push button (situated on the end of the left hand seat collective control).
4-4i fuel shutoff valve (4i -917Ti Engine)

*ATTENTION: The starter motor push button activates the engine starter motor only. It does not affect the state of the ignition circuits, which are controlled by the Ignition Key positions "OFF", "R", "L" and "BOTH" (refer to section « 1.2.13 Overhead Switch Panel»).

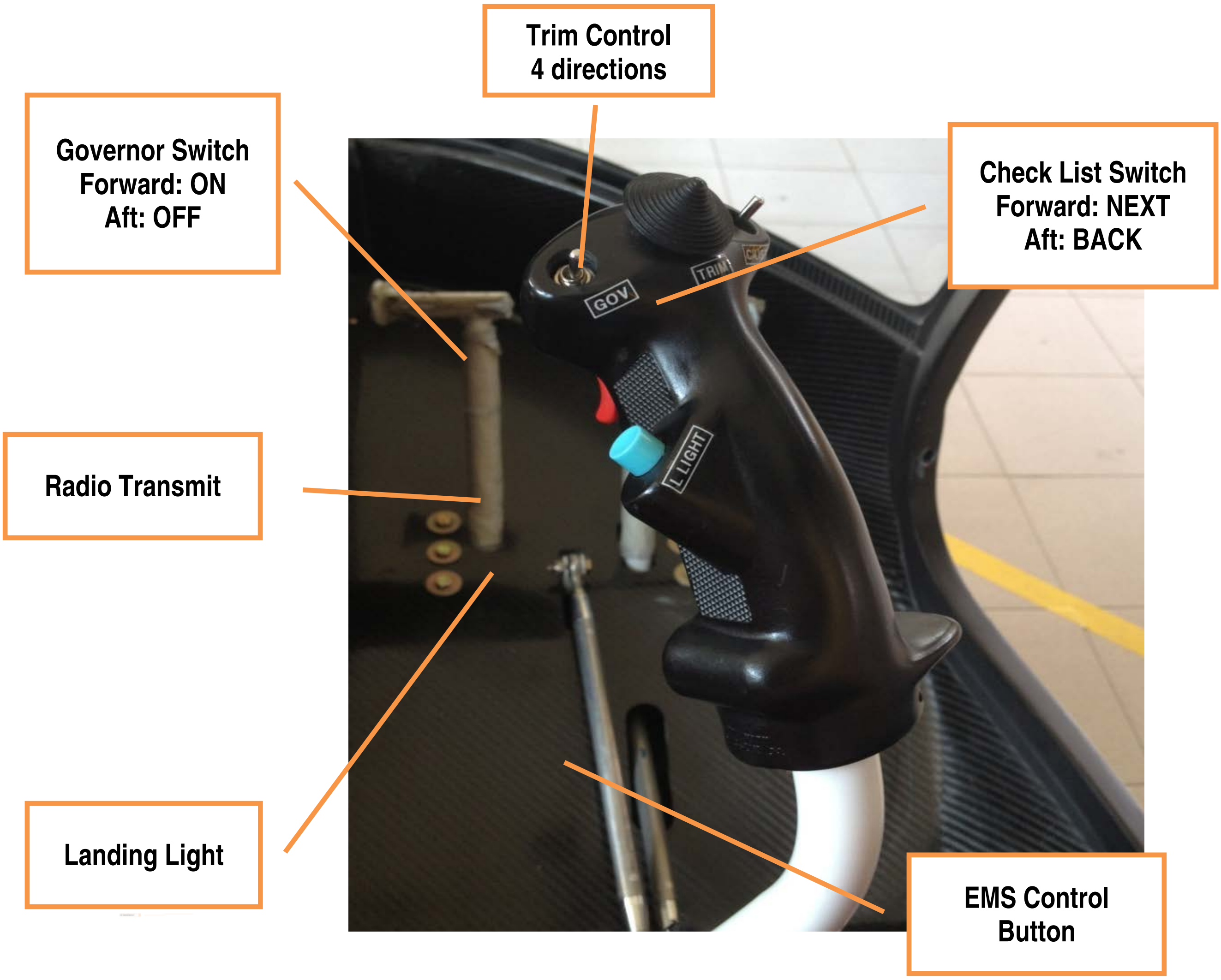
1.2.15Accessory Power Outlet

Type: Kamon



SECTION 1 – DESCRIPTION

1.2.16Cyclic Pitch Control



SECTION 1 – DESCRIPTION

1.2.17Voice Check-list and Alarm System

The Voice Checklist and Alarm System is connected directly to the auxiliary input of the radio. It allows the pilot to complete the start and shutdown procedures without reference to the paper checklist, and once in flight to hear voice alarms in the event of high or low rotor speed, low fuel level, or a range of engine parameter anomalies.

To begin the start-up procedure checklist, switch on the radio and move the Master switch to Checklist. Use the « NEXT » and « BACK » buttons on the instrument panel or the checklist toggle switch on the cyclic to follow the voice checklist until take-off.

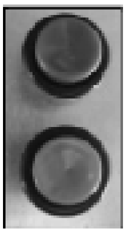
Once the governor control on the cyclic control is switched on towards the end of the start-up checklist, the voice alarm mode will activate and issue the appropriate voice warning whenever a warning LED on the tachometer or on the instrument panel illuminates.

After landing, press the green « NEXT » button to leave the voice alarm mode and to activate the shutdown procedure checklist.

CAUTION: The paper check-list must always be carried on board.

NEXT — Green button: Press for the next item on the checklist (or press forward on the cyclic checklist toggle switch). Press for 2 secs when in flight (warning) mode to activate the shutdown procedure checklist.

In flight (warning) mode press the red and green buttons simultaneously for the flight time elapsed.



BACK — Red button: Press to return to the previous item on the checklist (or press aft on the cyclic checklist toggle switch).

SECTION 1 – DESCRIPTION

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SECTION 2 — LIMITATIONS

CONTENTSSECTION 2

SECTION 2 — LIMITATIONS

2.1 GENERAL

The information contained in this section concern the operating limitations, instrument markings and placards required for the safe operation of the helicopter, its engine and other systems.

CAUTION: Should any of the limitations specified in this section be exceeded, guidance from an approved agent of CH-7 HELISPORT S.r.l. **MUST** be obtained and acted upon before further flight is attempted.

2.2 COLOUR CODES FOR INSTRUMENT MARKINGS

RED: Indicates operating limits. The needle should not enter into or above the red zone or line during normal operation.

YELLOW: Precautionary or special operating procedure range.

GREEN: Normal operating range.

2.3 AIRSPEED LIMITATIONS

NEVER EXCEED AIRSPEED

$V_{NE:}$ 130 mph

V_{NE}(with door or doors removed): 85 mph

AIRSPEED INDICATOR MARKINGS

Green arc: 40 mph to 100 mph

Yellow arc: 100 mph to 130 mph

Red line: 130 mph

SECTION 2 — LIMITATIONS

2.4 ROTOR

2.4.1 Rotor Speed Limitations

		TACHOMETER	ROTOR
Power On:	Max	104%	575rpm
	Min	96%	531rpm
Max speed limited to 5 seconds (Power on in pratic governor off):		106%	586rpm
Power Off (Autorotation):	Max	110%	608rpm
	Min	90%	498rpm

2.4.2 Instrument Markings

TACHOMETER COLOUR CODES

Red line:			110%
Upper yellow arc:	104%	to	110%
Green arc:	96%	to	104%
Central yellow arc:	90%	to	97%
Lower red line:			90%
Lower yellow arc:	60%	to	70%

SECTION 2 — LIMITATIONS

2.5 ENGINE

> CAUTION: Do NOT start the engine if the helicopter has not flown for more than 3 months without following the procedure outlined in Service Bulletin -SB 62.

2.5.1 Manifold Air Pressure

Manifold air pressure:	0 - 35.4inches	104%	Continuous
Manifold air pressure:	35.4 - 40inches		2 min or per Conditions

2.5.2 Engine/Rotor Speed Limitations

Engine/Rotor speed to5 500 rpm (104 % tachometer):	Continuous
Engine/Rotor speed between 5 500 rpm (104 %) and 5 600 rpm (106 %):	5 sec. maximum
Maximum engine speed limitation not to be exceeded(in star up)	: 5 800 rpm

SECTION 2 — LIMITATIONS

2.5.3Engine Temperature and Pressure Limitations

Airbox temperature(MT):	Max:	79°C	
Exhaust gas temperature (EGT):	Max:	950°C	
	Normal:	900°C	
Cylinder head temperature (CHT):	Max:	120°C	
	Max normal	110°C	
	Min normal	75°C	
Engine oil temperature:	Max:	125°C	
	Max normal:	110°C	
	Min normal:	90°C	
	Min:	50°C	
Engine oil pressure:	Normal:	2 bar to 5 bar	(above 3 500 rpm)
	Max:	7.0 bar	(during cold start only)
	Min:	1.5 bar	(below 3 500 rpm only)

SECTION 2 — LIMITATIONS

2.6 TRANSMISSION LIMITATIONS

The MGB, TGB, clutch bearing, swash-plate and tail rotor drive shaft bearing are all equipped with Telatemp temperature recording stickers. Any increase in the maximum temperature recorded could indicate component deterioration or failure.

Should the first window of any of the Telatemp stickers darken, note the corresponding temperature and related circumstances in the maintenance record. Flight is permitted.

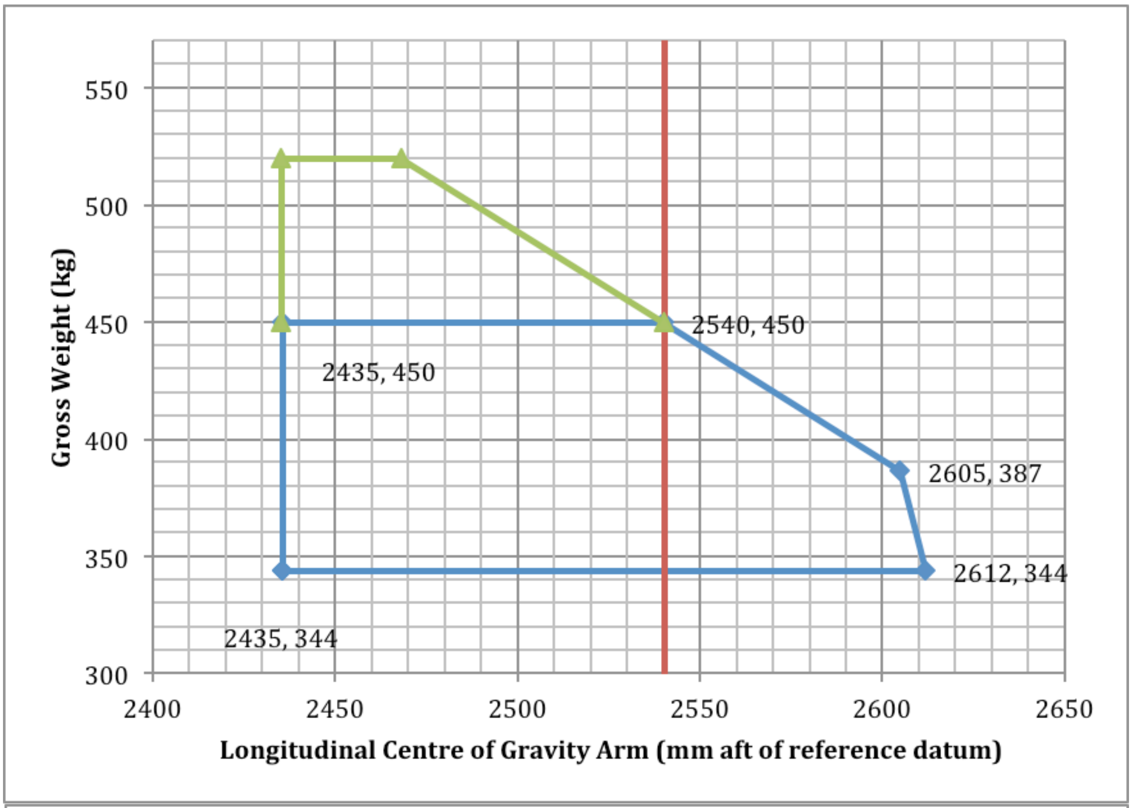
Should the second window of any of the Telatemp stickers darken, further flight is not permitted. Contact a maintenance organisation authorised by CH-7 HELISPORT S.r.l.

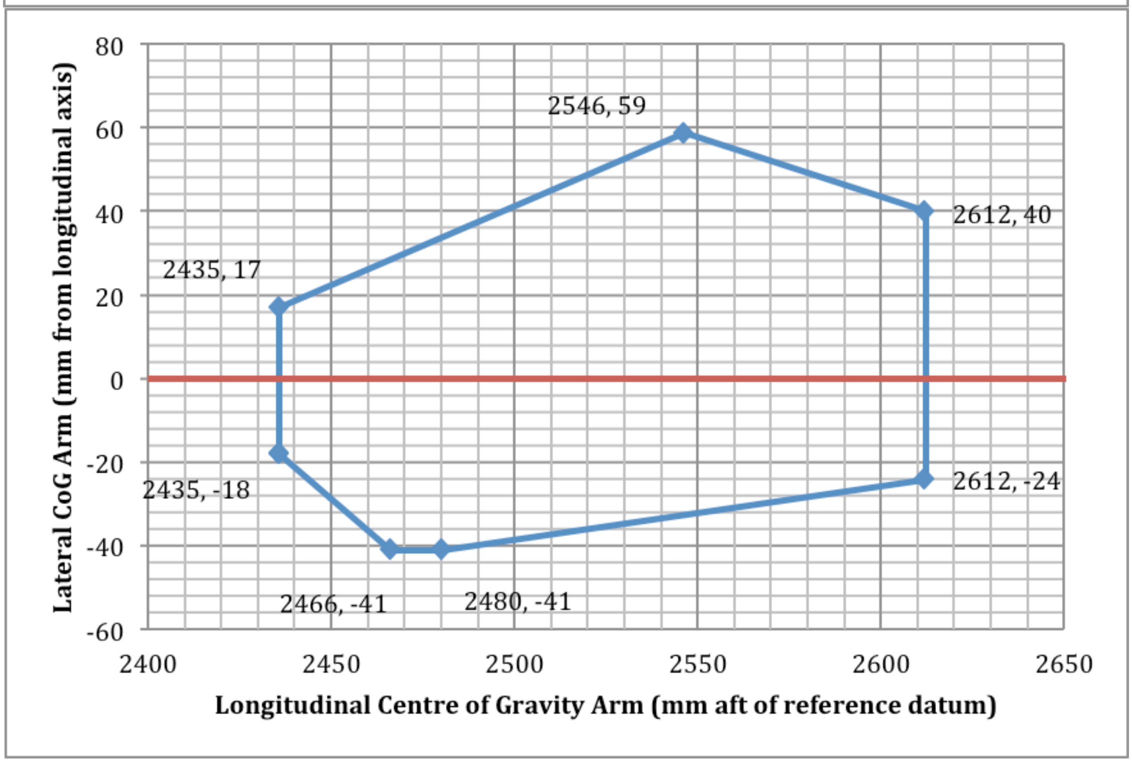
MGB temperature:	Max:	110°C
TGB temperature:	Max:	66°C
Clutch temperature:	Max:	66°C
Swash-plate temperature:	Max:	66°C
Tail rotor drive shaft bearing temperature:	Max:	66°C

2.7 WEIGHT LIMITATIONS

Standard empty weight:	280 kg
Maximum Take Off Weight:	450 kg
Maximum Take Off Weight (amphibious version):	500 kg
Maximum weight per seat:	108 kg
Minimum load weight (pilot, passenger, baggage and usable fuel):	69 kg

2.8 CENTRE OF GRAVITY LIMITATIONS





SECTION 2 — LIMITATIONS

2.9 OPERATIONS LIMITATIONS

Maximum number of occupants: 2.

The pilot and the passenger must be restrained by correctly buckled seatbelts. During solo flight the passenger seat belt must be buckled.

Solo flight from the left hand seat is prohibited.

Before exercising the function of aircraft commander, the pilot must have satisfactorily completed a course of instruction as specified in section « 7.4.1HELISPORT SAFETY COURSE » of this manual.

Flight with two occupants on board is prohibited with the dual controls fitted unless both the occupants are qualified helicopter pilots or unless one of the occupants is a qualified instructor.

In normal flight configuration, the aircraft commander occupies the right hand seat and the passenger occupies the left hand seat. In order to exercise the function of aircraft commander from the left hand seat, the pilot in the left hand seat must have satisfactorily completed a course of instruction as specified in section « 7.4.2 RANABOT LEFT SEAT INSTRUCTOR PILOT COURSE » of this manual.

Aerobatic manoeuvres are prohibited.

Flight in Instrument Meteorological Conditions is prohibited.

Flight in known icing conditions is prohibited.

Flight during snowfall is prohibited.

Avoid flight during rainfall if adhesive protective film is not installed on the leading edges of the main rotor blades.

In normal flight the governor must be switched on. Flight with the governor switched off is permitted for training purposes. During flight with the governor switched off, maintain rotor speed at the upper limit of the green arc (104 %) during take-off, initial climb, approach and landing, and during all flight at less than 300 ft AGL or above an altitude of 5 000 ft.

Flight with the doors removed at airspeeds not exceeding 85mph is permitted.

Flight with the doors unlatched is prohibited.

2.10 FUEL LIMITATIONS

Unleaded Mogas with an octane rating of not less than MON83 or RON 90.

Avgas 91UL.

AVGAS 100LL may be used subject to restrictions (see sub-section « 1.2.5 Fuel» and the latest Rotax engine manuals and Service Bulletins as modified by EPAPOWER documentation). (no with SA-R 917Ti)

FUEL TANKS

Main tank total capacity	33.5 l
Main tank usable fuel capacity	32 l
Auxiliary tank total capacity	32.5l
Auxiliary tank usable fuel capacity	32.5 l

Low fuel level alarm: The low fuel level warning light and voice alarm indicate when the fuel remaining will allow less than approximately 15 mins of further flight.

LAND IMMEDIATELY.

This reserve level must be calibrated because differences can exist between individual aircraft.

SECTION 2 — LIMITATIONS

2.11 PLACARDS

NO SMOKING	In clear view of both occupants.
UNLEADED MOGAS ROZ 95 AKI 91 91 UL AVGAS 100 LL AVGAS(no 917Ti)	Next to each fuel filler cap.
TOTAL FUEL CAPACITY 66LITRES (Main tank 33.5 litres Aux tank 32.5 litres)	Next to main fuel filler cap
FUEL ON - OFF	Next to fuel cock.
MAX LOAD 15KG	In baggage compartment.
MIN PILOT WEIGHT 65KG	In clear view of pilot.
FRICTION ON - OFF	On collective pitch control.
CHOKE OUT = ON IN = OFF	Next to choke control.
VENT	Next to cabin ventilation control.
HEAT	Next to cabin heating control.
LOCKED - OPEN	Next to door latch on each door.
EMERGENCY EXIT	Next to each emergency door release handle.
LOW G PUSHOVERS PROHIBITED	Next to right hand cyclic control.
SOLO FLIGHT FROM RIGHT HAND SEAT ONLY	Next to left hand cyclic control.

SECTION 3 — EMERGENCY PROCEDURES

CONTENTSSECTION 3

CONTENTS SECTION 3 (CONT)

SECTION3 — EMERGENCY PROCEDURES

3.1 POWER FAILURE

3.1.1 General

A power failure can be caused by an engine failure or a transmission failure.

An engine failure may be indicated by any combination of the following: a change in noise level or tone, decreasing engine speed, left yaw and oil low pressure warning light and voice alarm.

A transmission failure may be indicated by any combination of the following: an unusual noise or vibration, right or left yaw and decreasing rotor speed while engine speed increases.

> CAUTION: Aft cyclic is required when collective is lowered at high speeds and/or forward CoG.

3.1.2 Maximum Glide Angle Configuration

1	Approximate airspeed:	70 mph
2	Approximate rotor speed:	96%
3	Maximum glide ratio:	7 : 1

SECTION3 — EMERGENCY PROCEDURES

3.1.3 Power Failure Above 500 ft AGL

1 Immediately lower the collective in order to maintain rotor speed and to enter normal autorotation.

2 Adjust airspeed to approximately 70 mph.

3 Adjust collective to keep rotor speed in the middle of the green arc.

4 Choose a landing spot and, if the wind permits, manoeuvre so that the landing will be into the wind.

5 If time permits, attempt to restart the engine using the push button on the collective.

6 Switch off any unnecessary systems and shut the fuel cock.

7 At about 40 ft AGL begin cyclic flare in order to progressively reduce forward speed and rate of descent.

8 At about 8 ft AGL level the aircraft with a forward action on the cyclic and then raise the collective as the aircraft descends to cushion the landing. Land with the aircraft horizontal and the nose straight ahead.

CAUTION: Avoid aft cyclic during the touchdown and ground slide.

3.1.4 Power Failure Between 8 ft AGL and 300 ft AGL

1. Take off operation should be conducted according to the Height/Velocity diagram (see section « 5.6 Height / Velocity Diagram »)
2. In the event of power failure, immediately lower the collective in order to maintain rotor speed.
3. Adjust collective to keep rotor speed in the middle of the green arc.
4. If time permits, attempt to restart the engine using the push button on the collective.
5. Maintain airspeed until the ground is approached and then begin cyclic flare in order to progressively reduce forward speed and rate of descent.
6. At about 8 ft AGL level the aircraft with a forward action on the cyclic and then raise the collective as the aircraft descends to cushion the landing. Land with the aircraft horizontal and the nose straight ahead.

CAUTION: Avoid aft cyclic during the touchdown and ground slide.

3.1.5 Power Failure Below 8 ft AGL

1. Apply right pedal as required to cancel left yaw.
2. Slightly lower collective and allow the aircraft to descend.
3. Raise collective just before ground contact to cushion the landing.

3.2 DITCHING

3.2.1 Ditching Power Off

1 Follow the same procedure as described in section « 3.1 Power Failure » until contacting the water.

2 Upon water contact, apply right cyclic to stop the rotor.

3 Detach seat belts and evacuate aircraft once the rotor has stopped.

3.2.2 Ditching Power On

1 Descend to hover above water.

2 Detach seat belt.

3 Unlatch doors.

4 Passenger exit aircraft.

5 Fly to a safe distance from passenger to avoid injury from rotor blades.

6 Close throttle.

7 Apply right pedal to cancel yaw, keep aircraft level, apply full collective on water contact.

8 Apply right cyclic to stop the rotor.

9 Evacuate aircraft once the rotor has stopped.

3.3 TAIL ROTOR FAILURE

3.3.1 Tail Rotor Failure in Forward Flight

1. A tail rotor failure is indicated by right yaw that cannot be corrected by application of the left pedal.
2. Immediately enter autorotation.
3. Maintain an airspeed of 70 mph.
4. A small amount of collective with power, coupled with left cyclic, may be applied to extend range provided the resulting sideslip is not excessive and there is no tendency to spiral.
5. Adjust the applied collective and left cyclic to vary sideslip angle as required.
6. Choose a landing site, fully roll off throttle, and perform an autorotation landing, keeping the throttle rolled off while raising the collective by the minimum amount possible consistent with a safe landing.

3.3.2 Tail Rotor Failure During Hover

1. A tail rotor failure is indicated by right yaw that cannot be corrected by application of the left pedal.
2. Roll off the throttle and land as described in section « 3.1.5 Power Failure Below 8 ft AGL »
3. Keep throttle fully rolled off when raising collective at ground contact.

3.4 FIRE

3.4.1 Fire in Flight

1 Enter autorotation.

2 Open cabin vents.

3 If the engine is running, immediately land normally into the wind and close the fuel cock.

4 If the engine stops running, close fuel cock and perform an autorotation landing.

3.4.2 Fire During Engine Start on the Ground

1 Continue cranking the engine until start in order to suck flames and excess fuel through the carburettors into the engine.

2 If the engine starts, run at 60 % for a short time then shut down and check for damage.

3 If the engine does not start, close the fuel cock, switch off the Master switch, extinguish the fire and check for damage.

3.4.3 Electrical Fire in Flight

1 Master Switch off.

2 Generator Switch off.

3 Land immediately.

4 Close fuel cock, switch off engine, extinguish fire and inspect for damage.

SECTION3 — EMERGENCY PROCEDURES

3.5TACHOMETER FAILURE

1 Should either the rotor or the engine tachometer read zero, or otherwise clearly malfunctions during flight, land immediately using the tachometer that still functions correctly.

2 Should both the rotor and the engine tachometers read zero, or otherwise clearly malfunction during flight, but if the engine speed display on the Engine Monitoring System (EMS)is stable and coherent reading 5 500 rpm, land normally using the EMS engine speed reading.

3 Should the rotor and the engine tachometers show discordant values in flight, in order to determine which of them is working correctly, establish an airspeed of 70 mph and then slowly reduce engine speed with the throttle until the « Low RPM » warning light and voice alarm activates. The tachometer that indicates approximately 96 % at this point is correct and should be used to make a normal landing.

4 Should both the rotor and the engine tachometers and the EMS engine speed display not be working, land immediately using the « Low RPM » warning light and voice alarm to maintain rotor speed.

5 Unstable rotor and engine speeds, either with or without the simultaneous failure of both the tachometer readings, could indicate governor failure. Grip the throttle firmly to override the governor, and switch the governor off. Land using the EMS engine speed display to manually regulate rotor and engine speed.

3.6 CLUTCH FAILURE

3.6.1 Clutch Failure During the Start Up Procedure

Clutch failure can cause incorrect transmission belt tension. During every start up procedure, verify that the clutch activation LED remains lit for 90 seconds (+/- 10%). Should the clutch operate for longer than 110 seconds, pull the clutch breaker to prevent damage and shut down the engine. Should the clutch operate for less than 60 seconds, shut down the engine.

Do not take off. Rectify the fault before further flight.

3.6.2Clutch Failure in Flight

In flight, the clutch activation LED will illuminate automatically for a 3 second period if the circuitry detects that adjustment of the transmission belt tension is required. Should the clutch activation LED illuminate continuously for more than 6 seconds and the voice alarm « CLUTCHFAILURE » activate, pull the clutch circuit breaker.

Land normally as soon as possible.

Rectify the fault before further flight.

3.6.3 Clutch Failure During the Shutdown Procedure

During shutdown, if the clutch activation LED does not illuminate, the clutch is inoperative and the transmission belt will remain under tension. Continue with the shutdown procedure.

Rectify the fault before further flight.

SECTION3 — EMERGENCY PROCEDURES

3.7WARNING LIGHTS AND VOICE ALARMS

3.7.1Rotor / Engine Tachometer Warning Lights

HIGH ROTOR SPEED WARNING LIGHT

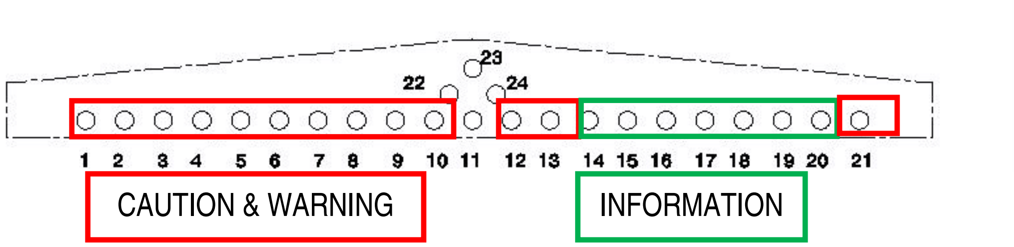
- The upper red LED on the tachometer illuminates if the rotor speed is greater than 104%.
- Reduce rotor speed.
- Associated voice alarm: « OVERSPEED ».

LOW ROTOR SPEED WARNING LIGHT

- The lower red LED on the tachometer illuminates if the rotor speed is less than 96%.
- If in flight, increase rotor speed.
- Associated voice alarm: « LOW RPM ».

SECTION3 — EMERGENCY PROCEDURES

3.7.2Instrument Panel Warning and Information Lights



1OIL LOW OIL PRESSURE

- Illuminates if the oil pressure descends below the minimum permitted (1.5 bar).
- ***Land immediately in autorotation***.
- Associated voice alarm: « OIL PRESSURE ».

2FRAME LOW FRAME GAS PRESSURE

- Illuminates if the gas pressure within the Frame is lost.
- Land as soon as possible and investigate.
- Associated voice alarm: « FRAME PRESSURE ».

3 **FUEL** LOW FUEL QUANTITY

- Illuminates if the quantity of fuel remaining in the main tank will allow only approximately 15 mins of further flight. This duration must be calibrated as it may vary between individual aircraft.
- ***Land immediately***.
- Associated voice alarm: « FUEL LEVEL ».

4 **GEN** INTEGRATED GENERATOR CHARGE FAILURE

- Illuminates if the integrated Main generator fails.
- Land as soon as possible and investigate.
- Associated voice alarm: « GENERATOR ».

- Blinking when the power supply is pair or less then consumption(*) on the ground with idle engine is normal - in fly monitoring the volts no lower then 12.9 in case Land as soon as possible and investigate

* With Atal 8000 regulator only

SECTION3 — EMERGENCY PROCEDURES

3.7.2Instrument Panel Warning and Information Lights (cont)

5 **ALT** AUXILIARY GENERATOR CHARGE FAILURE

- Illuminates if the auxiliary generator fails.
  Land as soon as possible and investigate
- Associated voice alarm: « ALTERNATOR »

- Blinking when the power supply is pair or less then consumption(*)
  on ground with idle engine is normal - in fly monitoring the volts no lower then 12.9 in case Land as soon as possible and investigate

* With Atal 8000 regulator only

6 **TCU** TURBO CONTROL UNIT ANOMALY

- Blinks in the event of a TCU or sensor anomaly.
- Engine performance may be reduced.
- Land as soon as possible and investigate.
- Associated voice alarm:« TCU CAUTION »

- Illuminates continuously if the TCU waste-gate control fails.
- Engine performance will be reduced.
- Land as soon as possible and investigate.
- Associated voice alarm:« TCU WARNING »

7 **BOOST** ENGINE POWER LIMITATION

- Illuminates when engine reach or exceeds power. (MAP > 38”).
- Use power in accordance with the limitations defined in section « 2.5.1 Manifold Air Pressure »
- Associated voice alarm:« OVERBOOST »

or

- Illuminates blinking in the event of excessive airbox temperature (>72°C) or sensor anomaly.
- Engine performance will be reduced.
- Immediately reduce power.
- Associated voice alarm:« AIRBOX TEMPERATURE»

SECTION3 — EMERGENCY PROCEDURES

3.7.2Instrument Panel Warning and Information Lights (cont)

8 **FLY BOX** ENGINE MONITORING SYSTEM ANOMALY

- Illuminates if the EMS indicates engine parameters out of limits.
- Determine which parameter(s) is concerned and land as soon as possible to investigate.
- Associated voice alarm: « INFO FLY BOX »

9 **PRESS** LOW FUEL PRESSURE

- Illuminates when the fuel pressure is low.
- Check fuel pump 2 is switched on. ***Land immediately***. Be prepared for a sudden engine stoppage and for entry into autorotation.
- Associated voice alarm: « FUEL PRESSURE ».

10 **FAN** ENGINE COOLING FAN FAILURE

- Illuminates when one or both of the fans fail.
- Manage the engine temperatures by reducing power and choosing optimal airspeed. Land if unable to maintain operational temperatures.
- Associated voice alarm: « FAN ANOMALY ».

11 **TRIM U** PITCH TRIM NEUTRAL

- Illuminates green when pitch control trim is neutral.

12 **MGB CHIP** MAIN GEARBOX CHIP DETECTION

- Illuminates when metallic debris is detected in the main gearbox.
- Land as soon as possible and investigate.
- Associated voice alarm: « MAIN ROTOR CHIP ».

13 **TGB CHIP** TAIL GEARBOX CHIP DETECTION

- Illuminates when metallic debris is detected in the tail gearbox.
- Land as soon as possible and investigate.
- Associated voice alarm: « TAIL ROTOR CHIP ».

SECTION3 — EMERGENCY PROCEDURES

3.7.2Instrument Panel Warning and Information Lights (cont)

14 Light not currently used.

15 **LAND** LANDING LIGHTS ON

- Illuminates when the landing lights are illuminated.

16 **NAV** NAVIGATION LIGHTS ON

- Illuminates when the navigation lights are illuminated.

17 **FAN 1** ENGINE COOLING FAN 1 ON

- Illuminates when engine cooling fan 1 is in operation.

18 **FAN 2** ENGINE COOLING FAN 2 ON

- Illuminates when engine cooling fan 2 is in operation.

19 **DEFROST** DEFROST system (optional)

- Illuminates when the defrost is switched on.

20 **GOV OFF** GOVERNOR OFF

- Illuminates when the governor is switched off.

21 **CLUTCH** CLUTCH MOTOR OPERATION

- Illuminates when electrical power is applied to the clutch motor. The lamp will automatically illuminate in flight for a three second period if the circuitry detects that adjustment of the transmission belt tension is required.
- If the lamp illuminates continuously in flight for a period of more than 6 seconds, immediately apply the procedure described in section « 3.6.2 Clutch failure in flight ».
- Associated voice alarm: « CLUTCH FAILURE »

SECTION3 — EMERGENCY PROCEDURES

3.7.2Instrument Panel Warning and Information Lights (cont)

21 23 **TRIM R** ROLL TRIM (otpional)

- Illuminates green when roll control trim is neutral.
- Illuminates green and red when roll control trim is applied right
- Illuminates green when roll control trim is full right.

22 24 **TRIM P** PITCH TRIM

- Illuminates green when roll control trim is neutral.
- Illuminates green and red when pitch control trim is applied forward.
- Illuminates red when pitch control trim is applied full forward.

SECTION4 — NORMAL PROCEDURES

CONTENTSSECTION 4

SECTION4 — NORMAL PROCEDURES

4.1 NORMAL OPERATION AIRSPEEDS

Take off and climbs:	60 mph
Maximum rate of climb (Vz max):	55 mph
Maximum range:	85mph
Approach:	60 mph
Autorotation:	70 mph
Max airspeed in turbulent air	100 mph
Never exceed airspeed (V_{NE}):	130 mph
$V_{NE}$with doors removed:	85 mph

SECTION 4 — NORMAL PROCEDURES

4.2 DAILY INSPECTIONS

Ensure that lighting conditions are sufficiently bright to properly conduct a visual inspection. If necessary, use additional lighting.
Before moving the aircraft, purge both fuel tanks.
Clean both main rotor blades and inspect for damage or for cracks in the paintwork. Inspect condition of tabs and leading edge protection, if fitted.
Clean the windows inside and outside.
Clean and inspect both tail rotor blades.
Remove the engine cowlings.
Vacuum clean the radiators and air filter as required.

ZONE 1 - NOSE SECTION

Slip string: check for condition and secure fixing.
Air inlets: check free from obstruction and operation of opening mechanism.
Pilot tube: check condition, fixing and unobstructed.
Radio and transponder antennae (if fitted): check for secure fixing.

ZONE 2 - CENTRAL LEFT SIDE OF ENGINE COMPARTMENT

Fuel pumps and filters: check for condition and leaks.
Engine coolant hoses: check for condition and leaks.
Radiators and mountings: check for condition and leaks.
Engine oil hoses: check for condition and leaks.
Main gearbox oil: check pump, hoses and radiator for condition and leaks.
Left fuel tank: check for secure mounting and for leaks.
Electrical connectors and probes: check condition.
Clutch: check for condition and wear, check electrical connections.
Transmission nut: check lock-wire.
Tail rotor transmission shaft flexible coupling: check for cracks and secure fixings.
Governor: check for wear and play in connecting rods, check motor for secure fixings.
Exhaust: check for condition and secure fixings.
Left carburettor and inlet manifold rubber flange: check for condition and secure fixing.
Engine coolant: check level and top up if necessary.
Turbo servomotor: check servomotor, electrical connection and cable for condition and fixing.
Left skid: raise the aircraft on its wheels and check condition of the under surface of the skid.

SECTION4 — NORMAL PROCEDURES

4.2 DAILY INSPECTIONS (CONT)

ZONE 3 - TAIL BOOM AND SUPPORT STRUTS

Tail boom and support struts: check fixings are secure and free from play.
Tail rotor drive shaft: check shaft slides longitudinally within its bearings.
Tail rotor drive shaft: check for condition of bearing and secure fixing of bearing housing.
Tail rotor bearing Telatemp: check no change in max recorded temperature.
Support strut attachment collar around tail boom: check for condition and secure fixings.

ZONE 4 - TAIL ROTOR

Blades: check for condition and wear and for the absence of any cracks.
Tail rotor hub: check free from play.
Tail rotor pitch control linkages: check for wear and for free movement and free of play.
Vertical and horizontal empennage: check for condition and secure fixing.
Empennage attachment collar: check for condition and secure fixings.
Tail gearbox oil level: check filler cap secure and oil level through sight glass.
Tail gearbox: check chip detector electrical connections.
Tail gearbox Telatemp: check no change in max recorded temperature.

ZONE 5 - REAR AND CENTRAL LEFT SIDE OF ENGINE COMPARTMENT

Remove right hand fuel tank.
Turbocharger: check for condition and leaks.
Turbo waste-gate: check cable and control linkage for wear and secure fixing.
Engine coolant hoses: check for condition and leaks.
Radiators and mountings: check for condition and leaks.
Electrical connectors and probes: check condition.
Airbox: check for condition and leaks and secure fixings.
Airbox peripherals: check fuel pressure regulator, electrical connections, and fuel and air hoses for condition, secure fixing and leaks.
Intercooler (if fitted): check for condition, secure fixing and leaks.
Cabin heater (if fitted): check for condition and secure fixing.
Right carburettor and inlet manifold rubber flange: check for condition and secure fixing.
Air filter and inlet hose: check for condition and secure fixing.
Exhaust: check for condition and secure fixings.
Tail rotor pitch control linkages: check for wear and for free movement and free of play.
Swash-plate and control linkages: check for wear and for free movement and free of play.
Swash-plate Telatemp: check no change in max recorded temperature

SECTION4 — NORMAL PROCEDURES

4.2 DAILY INSPECTIONS (CONT)

Engine oil hoses: check for condition and leaks.
Engine oil: check level and top up if necessary. Battery: check for condition, secure fixing and electrical connections.
Electrical connections on ground plate and regulator: check for condition and secure fixing.
Main gearbox oil: check for absence of leaks. If any evidence of leakage is detected, check oil level according to the procedure in the maintenance manual.
Transmission belt: check for wear. Lubricate exterior with silicone spray if required.
Lower transmission pulley and cooling fan: check condition and secure fixing with lockwire.
Right skid: raise the aircraft on its wheels and check condition of the skid under surface.
Replace right fuel tank: check for secure mounting and leaks and quick release fuel connector.

ZONE6 - CABIN INTERIOR

Doors: check latches, hinges and emergency releases function and are secure.
Seat belts: check condition and secure fixing.
Frame pressure: Check 2 bar.
Loose objects: securely stowed.
Flight controls and frictions: check fixings and articulations, free from play and absence of any loose object that could cause jamming. Lubricate if necessary.
Dual controls (if fitted): check securely fitted.
Instruments and switches: check condition.

Zone 7 –MAIN GEARBOX, MAST AND ROTOR HEAD

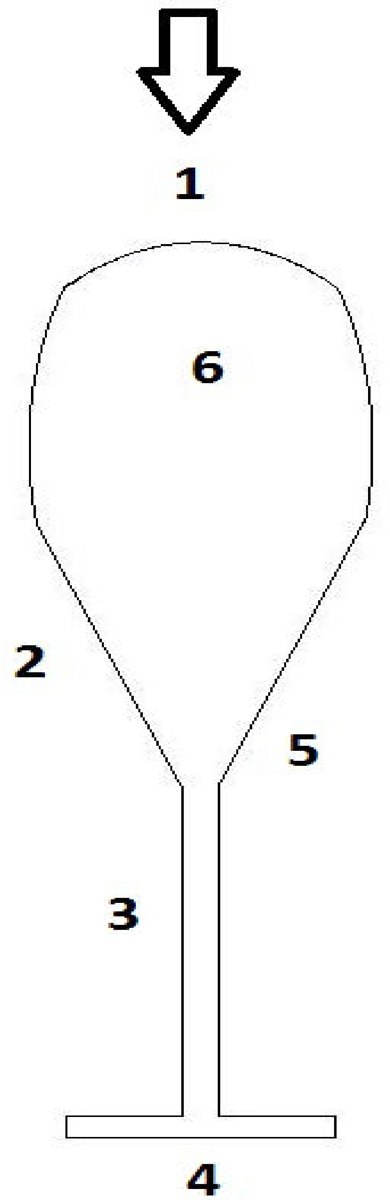
Rotor head hub and flanges: check for condition.
Rotor head centring bolts: check tight and lockwired.
Rubber mast protection: Check for signs of mast bumping.
Main rotor pitch control rods: check for condition, absence of play and lockwire.
Rotor blade root: check for secure fixing and condition (absence of cracks in glass upper surface).
Main gearbox: check chip detector electrical connections.
Main gearbox Telatemp: Check no change in max recorded temperature.

CHECK MAINTENANCE STATUS (BY CALENDAR PERIOD AND BY FLIGHT HOURS)

Note in the appropriate log all programmed maintenance operations, all incidents encountered and all resulting maintenance operations, accompanied by the corresponding date and number of flight hours.

4.2 DAILY INSPECTIONS (CONT)

PLAN OF ZONES FOR DAILY INSPECTION



4.3 PROCEDURE BEFORE ENGINE START

- Visually check the quantity of fuel in the tanks. Walk around the helicopter performing a final check of the aircraft exterior (cowlings properly closed, rotor ties removed, wheels removed, no loose items in the vicinity of the helicopter, no overhead obstructions, etc).
- Board the aircraft.
- If necessary, place a cushion of appropriate thickness behind the pilot's seat (and behind the left hand seat if dual controls are fitted) in order to allow the pilots to obtain full travel of the controls. Ensure that aft cyclic travel is not restricted by the use of the cushion.
- Put headset on, plug in and switch on if necessary.
- Check the radio is switched to the on position.
- Switch « MASTER » to Check list, while verifying that the « TCU » warning light illuminates briefly and then turns off.(SA-R 914 only) Verify the previous flight time announced by the Voice Check List is consistent with the last entry in the aircraft log and then continue as follows as prompted by the Voice Check List.
- Ensure both seat belts are buckled, whether or not the left hand seat is occupied. Check both doors are closed and properly latched by both the main latch handle and the upper forward latch. Check the emergency door release handles are in place and physically touch them in order to better recall their positions should an emergency arise. Brief the passenger on the emergency exit procedure.
- Check the fuel cock is open, verify there is sufficient fuel and reserve for the planned flight, and enter the fuel quantity as previously visually verified into the EMS.
- Release the cyclic and collective frictions and check that full and free movement of all combinations of the cyclic and collective controls and the pedals is present. Fully lower the collective, set the cyclic and pedals in their neutral positions, and tighten the frictions.
- Ensure all switches (except for « MASTER ») are off and that all circuit breakers are in.
- Set the altimeter according to the QNH or QFE pressure, as appropriate.
- Check the frame pressure is present (approximately 2 bar).

SECTION 4 — NORMAL PROCEDURES

4.4 START UP PROCEDURE

- If the engine is cold, move choke lever to « CHOKE ON (SA-R914 only)».
- Switch « MASTER » to Run and check the Oil Pressure, Generator,Alt. and Governor (TCU*)warning lights are illuminated.
- Check the fuel pressure warning light is extinguished and verify the fuel pressure reading on the EMS. Switch « Pump 2 » on and check the fuel pressure (reading increases). Switch « Pump 2 » off.
  (reading increases with SA-R914 Engine Pump1 0.37bar increases Pump2 0.52 bar)
  (reading increases with SA-R917 Engine Pump1 3.0bar increases Pump2 3.3 bar)
- Check the throttle is fully closed.
- Check the vicinity of the helicopter is free from obstructions and hazards.
- Crank the engine using the collective starter motor push button (max 5 second each)until the oil pressure light extinguishes (minimum 1. bar). Without releasing the starter motor push button, turn the ignition key to « R » and then « BOTH ».(TCU* light off) Once the engine starts, release the push button. Check the engine speed is not less than 1 800 rpm.
- Without delay, switch the clutch on, check the clutch light illuminates and note the time .Do not allow the engine to run for more than 10 seconds with the transmission belt loose. The clutch must be engaged as soon as the engine is started and oil pressure is established, otherwise pulley and transmission belt damage may occur.
- Switch the alternator on and check the voltage.
- Carefully turn the throttle from fully closed in order to take up the slack in the throttle cables up to the point at which the engine just begins to respond. Move the choke lever to « CHOKE OFF if installed ».
- Note the time at which the clutch light extinguishes. Carefully check the clutch motor does not run for more than 90 secs ± 10%. A longer or shorter running time will result in incorrect transmission belt tension.
- If the transponder is fitted, switch it to « STANDBY ».
- When the engine oil temperature reaches 35°C, increase the engine speed without pause to between 70% and 80%. Do not allow the rotor speed to rest in the range of55% to 70% in order to avoid the resonance that occurs within this zone.
- Turn the ignition key from « BOTH » to « R » and check the engine speed drops by no more than 150 rpm after 3 seconds. Turn the key back to « BOTH » and allow the engine speed to re-establish. Turn the ignition key from « BOTH » to « L » and check the engine speed drops by no more than 150 rpm after 3 seconds. Turn the key back to « BOTH ».

SECTION 4 — NORMAL PROCEDURES

- When the engine oil temperature reaches 50°C, increase the engine speed to 90% and then cut the throttle. Verify the transmission free wheel operates by checking the tachometer needle split (the tachometer engine speed needle should drop rapidly to 40/50% while the rotor speed needle declines more slowly). Check the engine speed with the throttle fully reduced is not less than 1 800 rpm and not more than 2 650 rpm (40/50%).

(*only with SA-R 917 Ti)

4.5 PROCEDURE BEFORE TAKE OFF

- Check the doors are closed and latched.
- Check the fuel cock is open and the choke is off and switch on Fuel Pump 2.
- Check all circuit breakers are in
- Press « TEST » buttons and check all warning lights illuminate.
- Release the cyclic friction.
- Release the collective friction, verify the oil temperature is over 50°C, increase the engine speed to 90% and switch the governor on. Check the engine and rotor speeds stabilise at 104%.
- Check the outside temperature and verify the expected aircraft performance is compatible with the planned flight.
- Check all engine parameters are within normal limitations.
- Set the radio volume and frequency.
- If the transponder is fitted, switch it to « AC »
- Check the wind strength and direction and that the vicinity of the aircraft is still clear of any hazards.
- Slowly reduce the engine speed and verify that the low rotor speed warning light and voice alarm activate at 96%. Release the throttle and allow the governor to re-establish engine and rotor speed of 104%.
- Ready for take-off.

SECTION4 — NORMAL PROCEDURES

4.6 TAKE OFF

1 Slowly raise the collective pitch control while turning the throttle to accompany the governor as it maintains 104% engine and rotor speed.

2 Stabilise the helicopter in hover IGE.

> CAUTION: Check the presence of the ground effect by observing the decrease in MAP as the helicopter descends and ground effect is entered. Ground effect with the CH-77 is generally effective below a skid height of 50cm.

3 Check engine parameters are within normal limitations.

4 Move the cyclic pitch control forwards and accelerate to climb airspeed while remaining within the profile shown in the height / velocity diagram section « 5.6 HEIGHT / VELOCITY DIAGRAM ».

5 Maintain rotor speed at the upper limit of the green arc during take-off and climb.

4.7APPROACH

1 Maintain engine / rotor speed at 104% and engine instruments within green arc. Establish final into the wind at an airspeed of 60 mph.

2 Progressively reduce airspeed and altitude to hover IGE while remaining within the profile shown in the height / velocity diagram section « 5.6 HEIGHT / VELOCITY DIAGRAM ».

3 Ensure the vertical speed of descent is less than 500 ft/min before allowing the airspeed to descend below 30 mph.

4.8 LANDING

1 From a stabilised hover in ground effect, progressively lower the collective until ground contact while maintaining a constant heading with the pedals.

2 After initial ground contact, fully lower collective.

> CAUTION: When landing on a slope, move the cyclic to its neutral position before fully lowering the collective.

SECTION4 — NORMAL PROCEDURES

4.9SHUT DOWN PROCEDURE

- Lower the collective to its full down position and apply the friction.
- Press « NEXT » and continue as follows as prompted by the Voice Check List.
- Switch the governor off and slowly reduce the engine speed to between 70% and 80% and note the time.
- Adjust the pitch and roll trims to neutral.
- Switch the « FAN » on and Switch PUMP 2 off
- 60 seconds after the engine speed reduction, further reduce the engine speed to 50% and apply the cyclic friction.
- Allow the CHT and Engine Oil temperature to fall below 90°C. Do not switch off the fan in order to allow it to continue to cool the turbo.
- Switch the « CLUTCH » off, check the clutch light illuminates and note the time.
- 40 seconds after the clutch motor start, **Switch off the ignition key**,
- **Switch off the ignition key** and Switch MASTER in check list position.
- Note the time at which the clutch light extinguishes. Carefully check the clutch motor does not run for more than 100 secs ± 10%. A longer or shorter running time is indicative of incorrect clutch adjustment. Contact an approved agent of CH-7 HELISPORT S.r.l. for guidance.
- Switch « MASTER » to off and all Switch off
- Enter the flight details into the aircraft log book. See section « 0.2GENERAL INFORMATION »

CAUTION:	Never attempt to slow the rotor during shutdown by raising the collective. The blades could flap and strike the tail boom.
CAUTION:	Hold the throttle closed if the occupant of the left hand seat is entering or leaving the helicopter with the dual controls installed.
CAUTION:	Never leave the flight controls unattended while the engine is running.
CAUTION:	In order to avoid evaporation and corrosion in the fuel circuit, only close the fuel cock in case of necessity for maintenance or for safety reasons.

SECTION4 — NORMAL PROCEDURES

4.10PRACTICE AUTOROTATION

4.10.1 With Power Recovery Below 4 000 ft AMSL

1 Fully lower the collective without reducing the throttle.

2 Reduce the throttle to split the tachometer needles.

3 Maintain the rotor speed in the middle of the green arc and maintain an airspeed of 70 mph.

4 At about 40 ft AGL, begin cyclic flare in order to progressively reduce forward speed and rate of descent. At about 8 ft AGL level the aircraft with a forward action on the cyclic and then as the aircraft settles stop the descent by raising the collective while rotating the throttle back to its original position.

4.10.2 With Power Recovery Above 4 000 ft AMSL

1 Proceed as described above in section 4.8.1, except slightly reduce the throttle before lowering the collective, and reopen the throttle slightly before raising the collective.

2 After commencing the final approach, maintain a minimum engine speed of 70%.

4.10.3With Ground Contact

1 Should it be necessary to demonstrate autorotation to ground contact, proceed as described above in section 4.8.1, except that as the aircraft settles, accompany it to touchdown by raising the collective to a lesser degree.

2 Ensure the skids are level and the nose is straight ahead at touchdown and throughout the ground slide.

SECTION 4 — NORMAL PROCEDURES

4.11NOISE ABATEMENT

To improve the quality of the environment, and so as not to provoke the introduction of restrictive public regulation, it is important that each pilot causes the least possible noise irritation to the general population.

Whenever possible:

1 Avoid over-flight of any assembly of people.

2 Avoid blade slap. Blade slap occurs during shallow high-speed descents, and especially while turning. Prefer a slower steeper descent profile. Better piloting technique can easily eliminate blade slap.

3 Avoid low level flight under 1000 ft AGL. Increased height greatly reduces noise levels.

4 Repetitive noise is much more irritating than a single occurrence. If flight over the same area must be made more than once, vary the flight path to avoid over-flight of the same buildings each time

CAUTION: The recommended noise abatement procedures above should not be applied should they be incompatible with air traffic control procedures or would result in an unsafe flight path.

SECTION5 — PERFORMANCE

CONTENTSSECTION 5

SECTION5 — PERFORMANCE

5.1 GENERAL

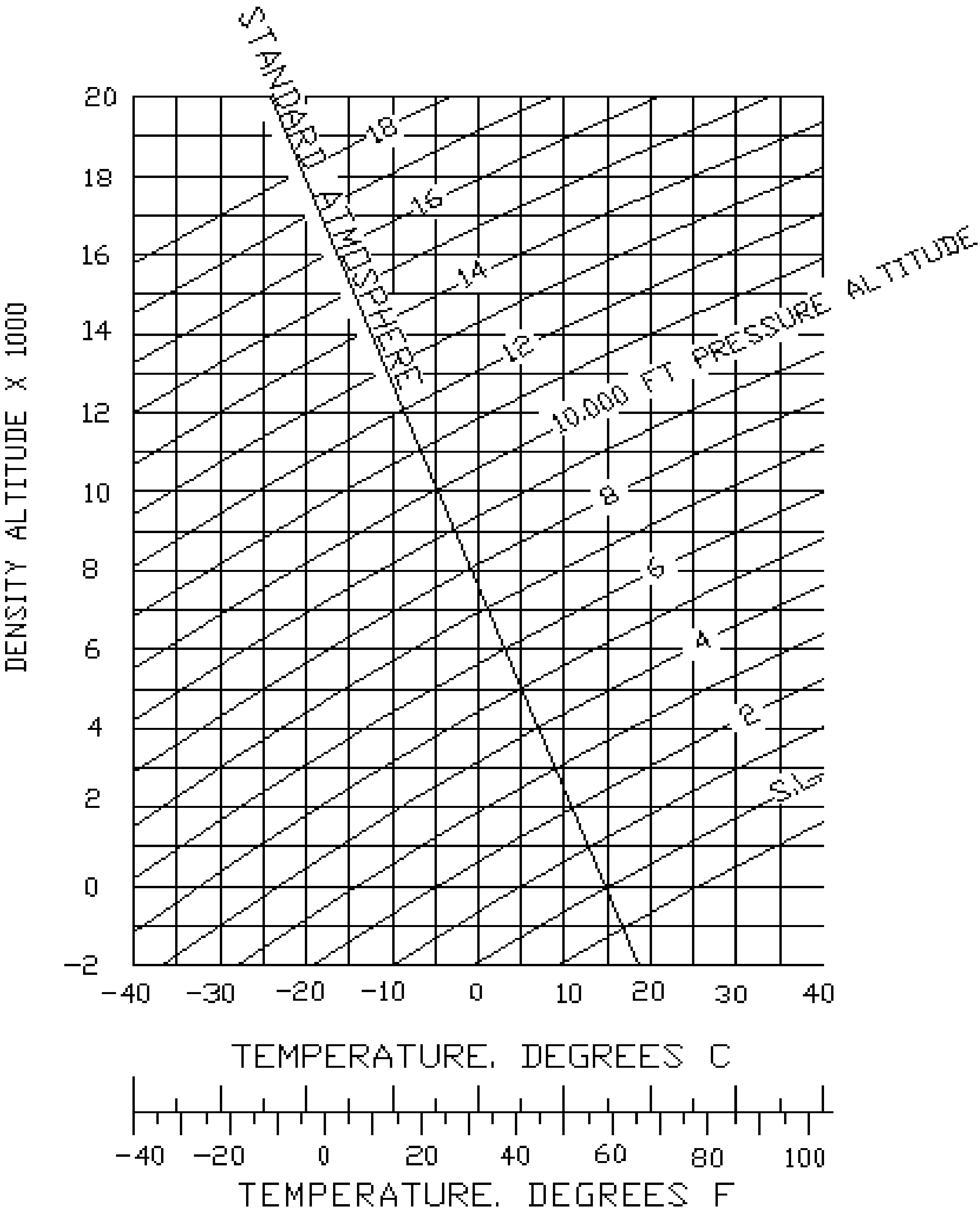
Hover controllability has been demonstrated in winds of 15 knots from any direction up to a density altitude of 11 500 ft.

Refer to the IGE hover ceiling diagram for the maximum allowed gross weight.

CAUTION: The performance data presented in this section was obtained under ideal conditions. Performance under other conditions may be substantially reduced.

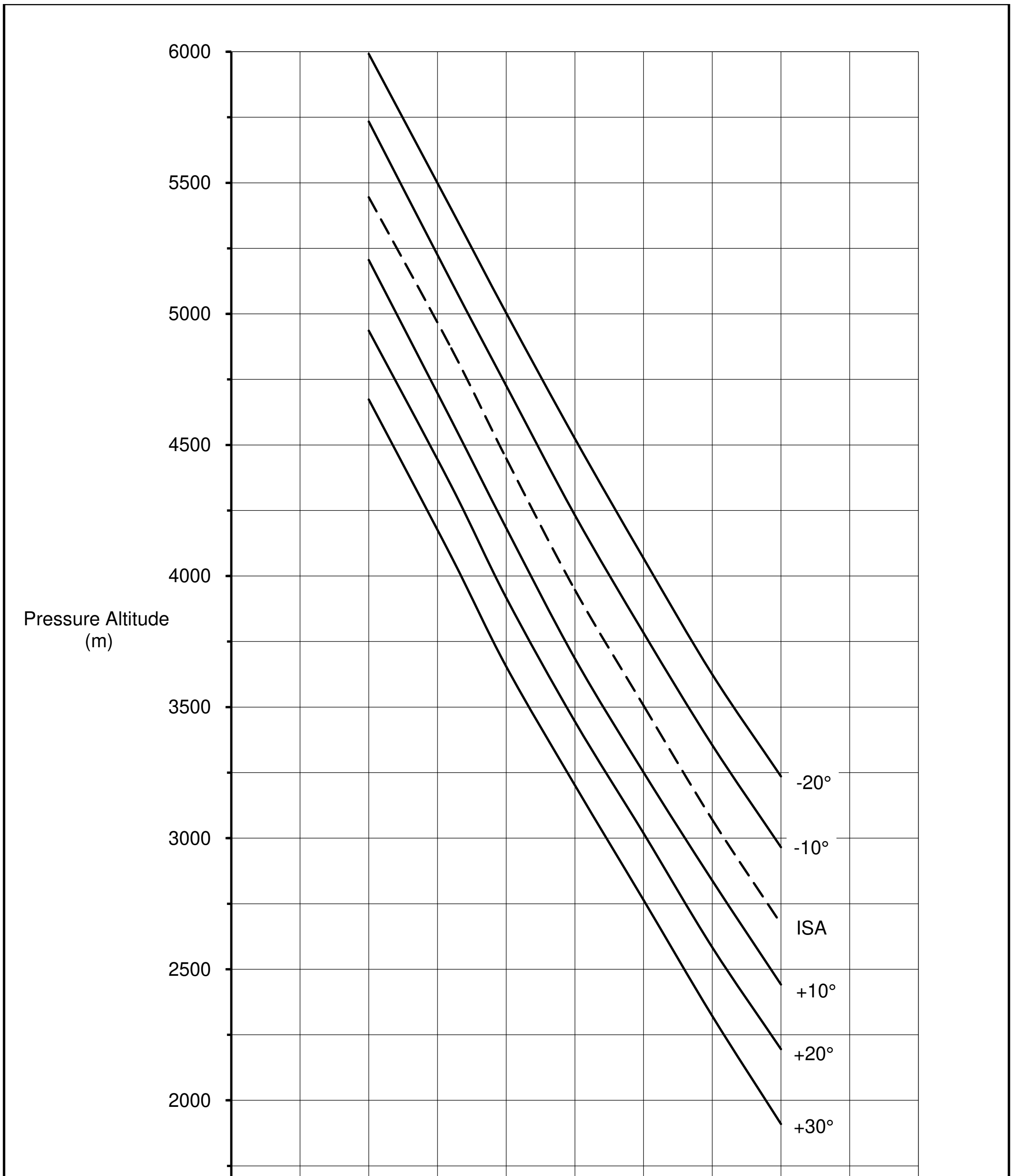
SECTION 5 — PERFORMANCE

5.2 ALTITUDE DENSITY DIAGRAM



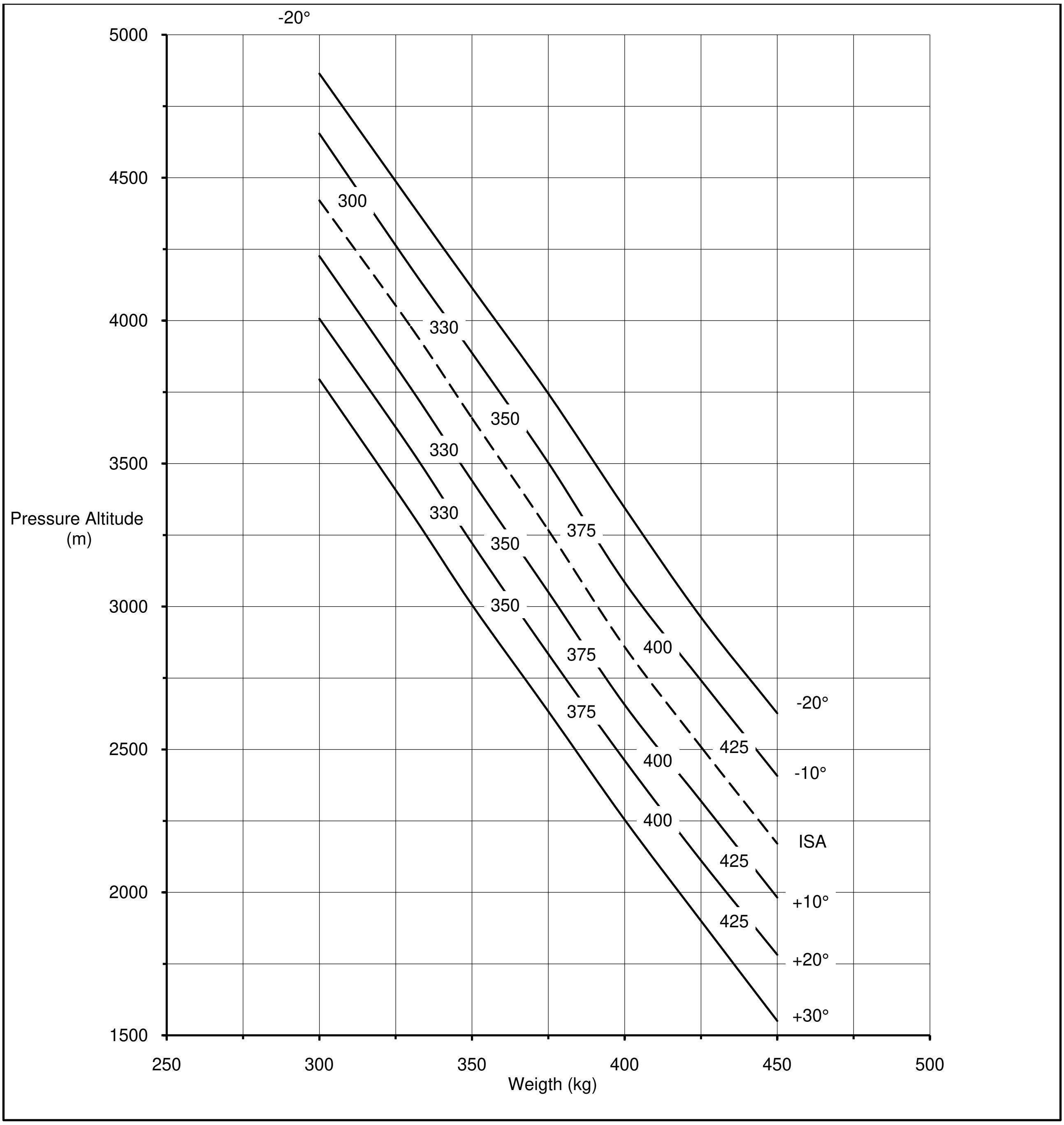
SECTION 5 — PERFORMANCE

5.3 IGE HOVER CEILING / GROSS WEIGHT



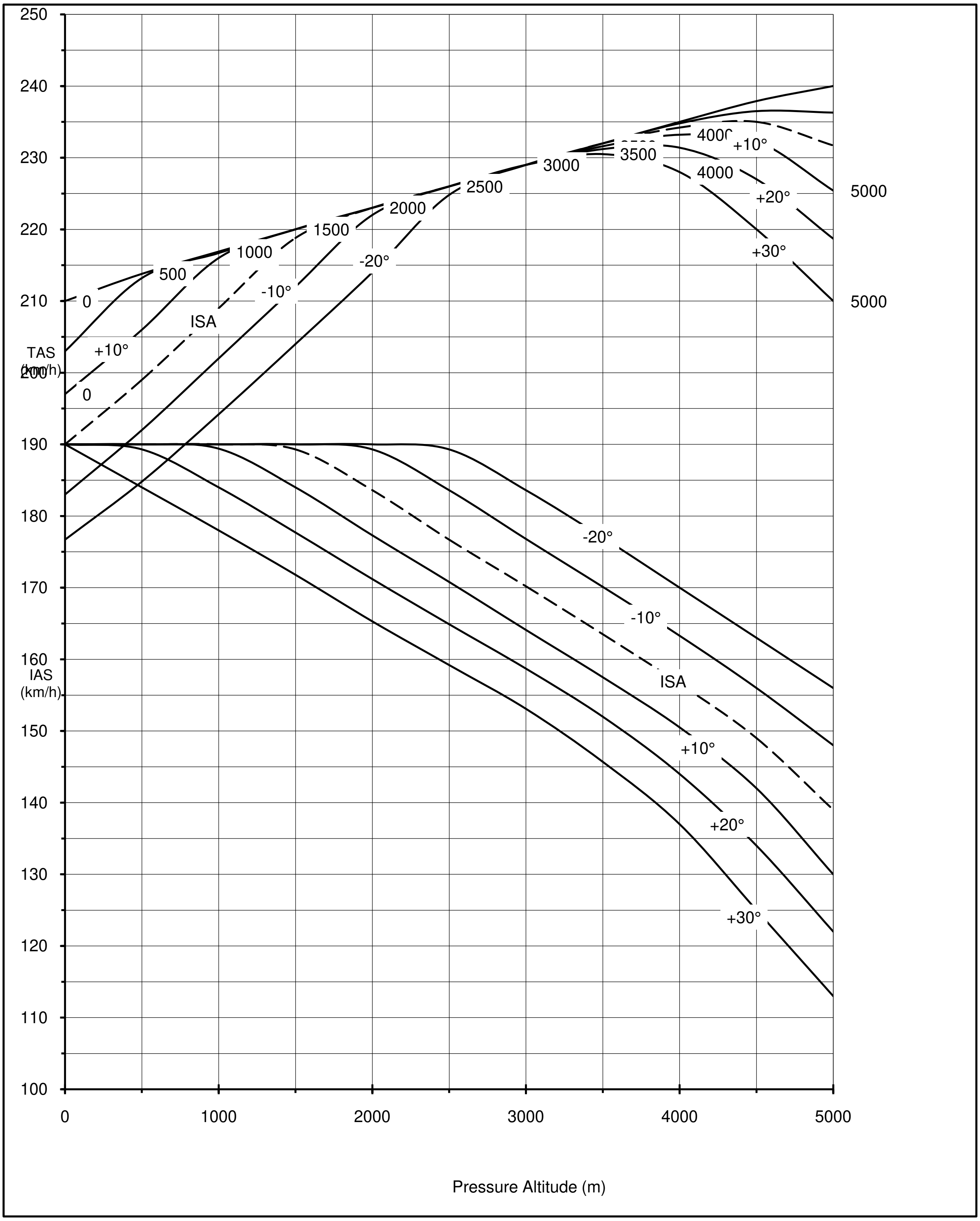
SECTION5 — PERFORMANCE

5.4 OGE HOVER CEILING / GROSS WEIGHT



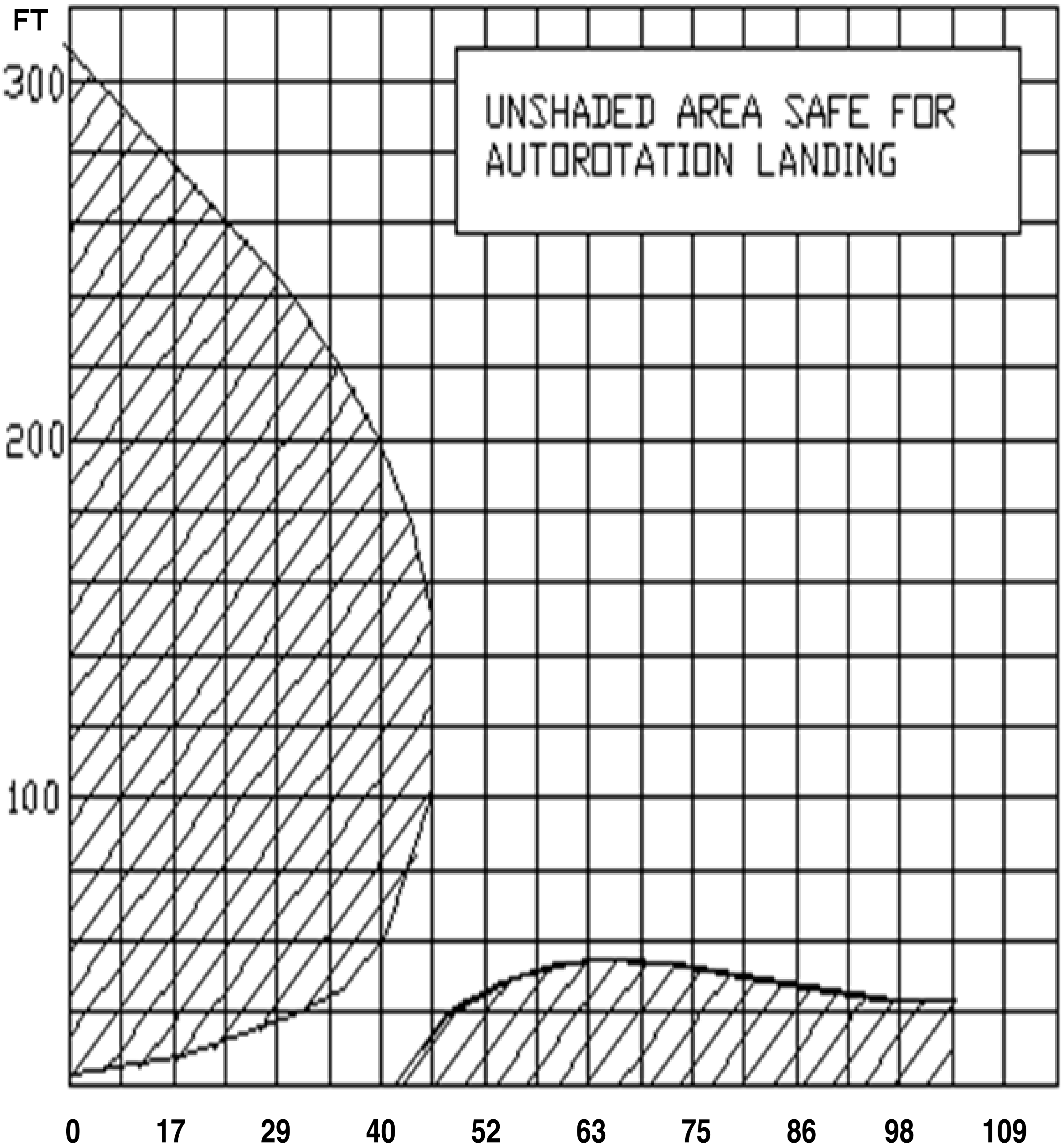
SECTION5 — PERFORMANCE

5.5 NEVER EXCEED AIRSPEED / ALTITUDE



SECTION5 — PERFORMANCE

5.6 HEIGHT / VELOCITY DIAGRAM



CONDITIONS : SURFACE DURE ET LISSE
VENT CALME
PUISSANCE 104%

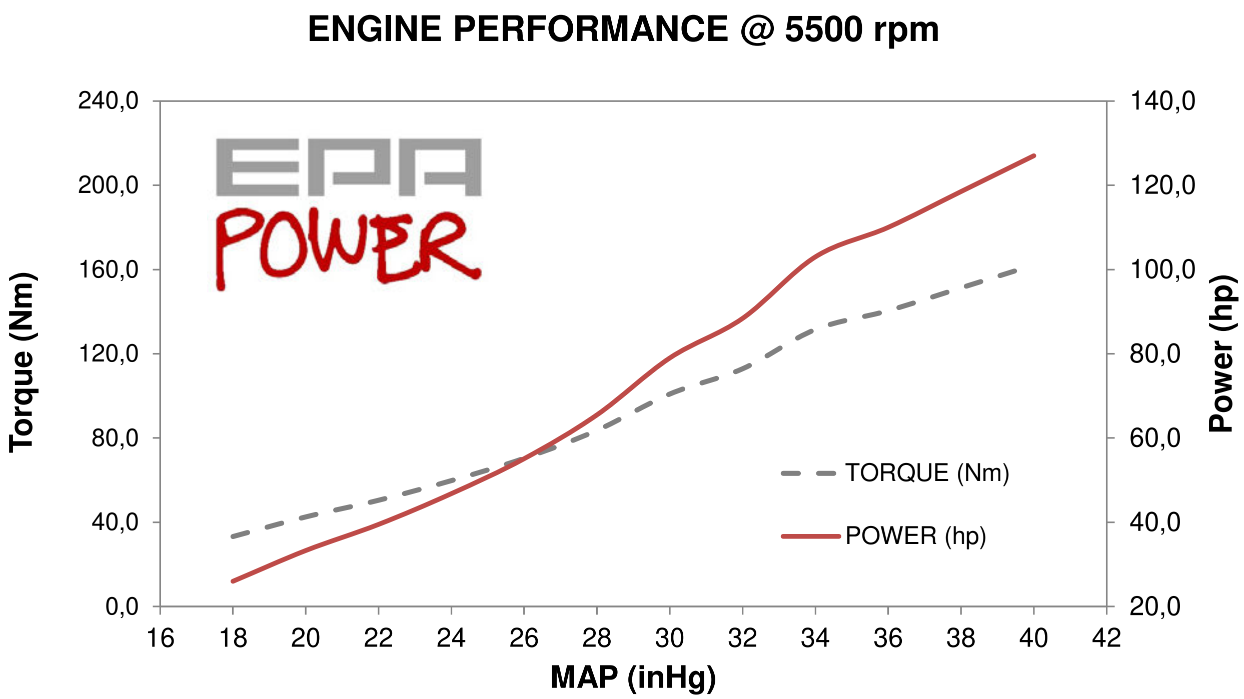
5.7 ENGINE PERFORMANCE DIAGRAMS

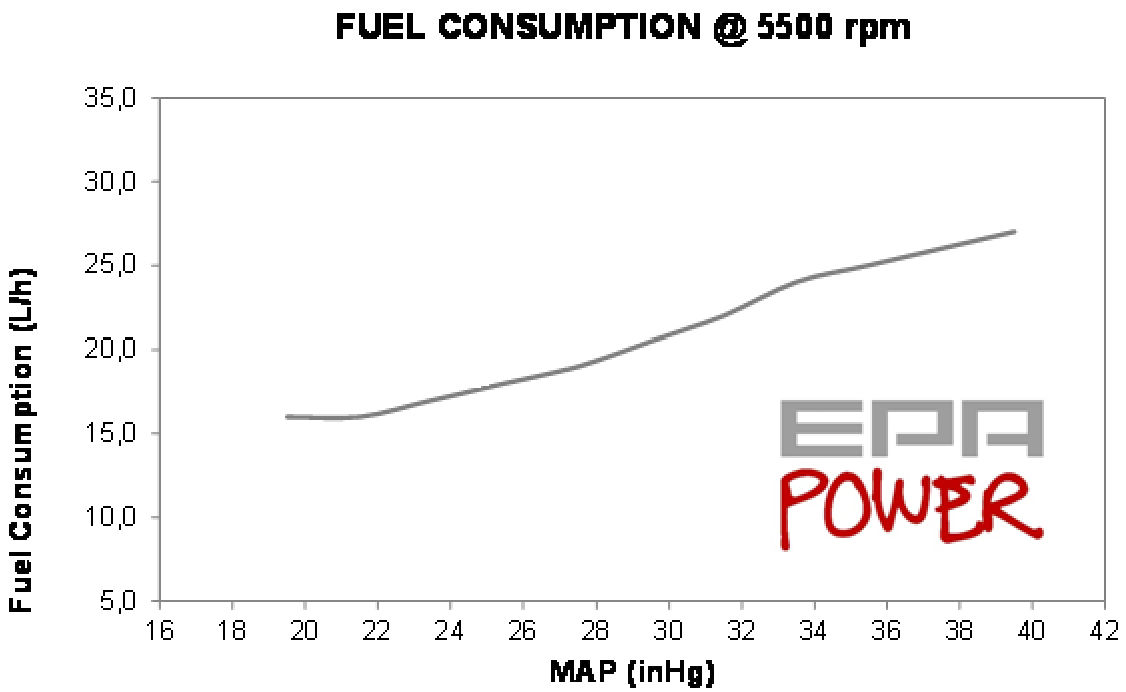
EPAPOWER'SA)R914h'1400'cc')'ENGINE'PERFORMANCE

MAXIMUM AVAILABLE POWER ATFULL$THROTTLE$(40"$MAP)$MAX5SECS	98.5kW(132$hp)$@5800rpm
TAKEOFFPOWER ATFULL$THROTTLE$(40"$MAP)$MAX5MINS	94.7kW(127$hp)$@5500rpm
MAXIMUM$CONTINUOUS$POWER $(LIMITED$TO$35.4"$MAP)	80.5kW(108$hp)$@5500rpm

PERFORMANCEAT5500$RPM			
MAP$(inches$Hg)	POWER$(kW)	POWER$(hp)	TORQUE$(Nm)
18	19.4	26.0	33.2
20	24.8	33.3	42.5
22	29.5	39.5	50.4
24	34.9	46.8	59.8
26	41.1	55.1	70.4
28	48.8	65.5	83.6
30	58.9	79.0	100.9
32	65.9	88.4	112.9
34	76.8	103.0	131.5
36	82.0	110.0	140.5
38	88.4	118.5	151.3
40	94.7	127.0	162.2

5.7 ENGINE PERFORMANCE DIAGRAMS(CONT)





SECTION 5 — PERFORMANCE

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SECTION6 — WEIGHT AND BALANCE

CONTENTS SECTION 6

SECTION 6 — WEIGHT AND BALANCE

6.1 GENERAL

Flight is only permitted within the weight and balance limits specified in section« 2.8 CENTRE OF GRAVITY LIMITATIONS ». Loading outside these limits can result in insufficient control travel to safely control flight.

The longitudinal weight and balance limits specified in section « 2.8 CENTRE OF GRAVITY LIMITATIONS » are expressed in this section as total moments. These total moments may be determined using the method described in section « 6.3 WEIGHT AND BALANCE EXAMPLES ».

CAUTION: The fuel tanks are not located at the centre of gravity of the helicopter. As a consequence, the CoG will move during flight as fuel is consumed.

Always determine the safe loading with empty fuel as well as with take-off fuel quantity. The amount of fuel that may be offloaded to compensate for a greater payload is limited by the forward CoG location with empty fuel.

SECTION6 — WEIGHT AND BALANCE

6.2 HELICOPTER WEIGHING PROCEDURES

PREPARATION OF THE AIRCRAFT

1 Drain all usable fuel.

2 Fill engine oil and transmission oil to maximum levels.

3 Ensure that all equipment corresponding to the basic empty weight configuration is correctly installed.

4 Remove any foreign items not included in the basic empty weight configuration (such as maps, tools or rags).

WEIGHING AND BALANCING THE AIRCRAFT

1 Raise the aircraft and place a 250 kg capacity scale under each skid.

2 Lower the aircraft to rest on the scales. Move the scales so that the aircraft is perfectly balanced before releasing the tail boom. Ensure the aircraft is laterally horizontal by placing a level between the manoeuvring wheel supports.

3 The aircraft empty weight corresponds to the sum of the weights indicated by the two scales.

4 Lower the tail boom, remove the two scales and place a 5 cm diameter steel tube under the two skids.

5 Balance the aircraft is on the tube while the aircraft remains laterally horizontal and the tube remains perpendicular to the mid-line between the skids. Mark the point of balance on a skid.

6 Mark also on this skid the point of intersection of the vertical plane that is both perpendicular to the mid-line between the two skids and passes through the centre of the main rotor disc.

7 Given that the reference plane is parallel to and 254 cm forward of the plane defined in paragraph 6, Measure the distance from the reference plane to the point of balance marked on the skid. This distance corresponds to the arm of the centre of gravity of the empty aircraft.

SECTION6 — WEIGHT AND BALANCE

6.2 HELICOPTER WEIGHING PROCEDURES (CONT)

8 Use the table below to calculate the longitudinal and lateral positions of the CoG of the aircraft in its flight configuration both with take-off fuel weight and with tanks empty.

a) In each of the lighter blue cells, enter the weight of the corresponding item. If either door is removed, enter the corresponding weight as a negative value.
b) In each of the darker blue cells, enter the sum of all of the lighter blue cells in the table found above it. Ensure the higher of these values is less than the MTOW.
c) In each of the grey cells enter the CoG arm determined in paragraph 7 above.
d) In each of the lighter pink cells, enter the product of the weight and the longitudinal arm of the corresponding item.
e) In each of the darker pink cells, enter the sum of all of the lighter pink cells in the table found above it.
f) In each of the lighter orange cells, enter the product of the weight and the lateral arm of the corresponding item.
g) In each of the darker orange cells, enter the sum of all of the lighter orange cells in the table found above it.
h) In each of the lighter green cells, enter the longitudinal arm, which is calculated by dividing the value in the darker pink cell to its right by the value in the darker blue cell to its left. Ensure both these values lie within the envelope defined in section « **2.8 CENTRE OF GRAVITY LIMITATIONS** »
i) In each of the darker green cells, enter the lateral arm, which is calculated by dividing the value in the darker orange cell to its right by the value in the darker blue cell to its left. Ensure both these values lie within the envelope defined in section « **2.8 CENTRE OF GRAVITY LIMITATIONS** »

Item	Weight (kg)	Longitudinal arm (mm)	Lateral arm (mm)	Longitudinal moment (kg*mm)	Lateral moment (kg*mm)
Right skid scale indication			825		
Left skid scale indication			-825		
Right door (-3,50kg if removed)		2020	560		
Left door (-3,50kg if removed)		2020	-560		
Pilot (right hand seat)		1985	245		
Passenger (left hand seat)		1985	-245		
Auxiliary fuel tank (1,56kg if fitted)		2490	340		
Weight & arms (no fuel)					
Fuel in main tank		2490	-340		
Fuel in auxiliary tank		2490	340		
Weight & arms (with fuel)					

SECTION 6 — WEIGHT AND BALANCE

6.3 WEIGHT AND BALANCE EXAMPLES

Moment:	Product of the weight and the arm.
Longitudinal arm:	Horizontal distance to the centre of gravity of the item measured from the reference datum (2.54 m forward of the main rotor centre.)
Lateral arm:	Horizontal distance to the centre of gravity of the item measured from the vertical longitudinal plane passing through the mid-line between the two skids. A lateral arm towards the right of the aircraft is expressed as a positive value and a lateral arm towards the left of the aircraft is expressed as a negative value.
Fuel density:	0.70 kg/litre.

6.3.1 Example1

Item	Weight (kg)	Longitudinal arm (mm)	Lateral arm (mm)	Longitudinal moment (kg*mm)	Lateral moment (kg*mm)
Right skid scale indication	140.5	2745	825	385 673	115 913
Left skid scale indication	141.5	2745	-825	388 418	-116 738
Right door (-3.5 kg if removed)	0	2020	560	0	0
Left door (-3.5 kg if removed)	0	2020	-560	0	0
Pilot (right hand seat)	90	1985	245	178 650	22 050
Passenger (left hand seat)	10	1985	-245	19 850	-2 450
Auxiliary fuel tank (1.6kg if fitted)	0	2490	340	0	0
Weight & arms (no fuel)	**382**	**2 546**	**49**	972 590	18 775
Fuel in main tank	12.6	2490	-340	31 374	-4 284
Fuel in auxiliary tank	0	2490	340	0	0
Weight & arms (with fuel)	**394.6**	**2 544**	**37**	1 003 964	14 491

In this example, the take-off weight is no more that the MTOW and the total longitudinal and lateral arms both with take-off fuel and with fuel empty are within the envelope defined in section « **2.8 CENTRE OF GRAVITY LIMITATIONS ».** Flight is permitted.

6.3.2 Example2

Item	Weight (kg)	Longitudinal arm (mm)	Lateral arm (mm)	Longitudinal moment (kg*mm)	Lateral moment (kg*mm)
Right skid scale indication	140.5	2 745	825	385 673	115 913
Left skid scale indication	141,5	2 745	-825	388 418	-116 738
Right door (-3.5 kg if removed)	-3,5	2020	560	-7 070	-1 960
Left door (-3.5 kg if removed)	0	2020	-560	0	0
Pilot (right hand seat)	90	1985	245	178 650	22 050
Passenger (left hand seat)	10	1985	-245	19 850	-2 450
Auxiliary fuel tank (1.6 kg if fitted)	0	2490	340	0	0
Weight & arms (no fuel)	**378.5**	**2 551**	**44**	965 520	16 815
Fuel in main tank	24.5	2490	-340	61 005	-8 330
Fuel in auxiliary tank	0	2490	340	0	0
Weight & arms (with fuel)	**403**	**2 547**	**21**	1 026 525	8 485

In this example, the take-off weight is no more that the MTOW and the total longitudinal and lateral arms both with take-off fuel and with fuel empty are within the envelope defined in section « **2.8 CENTRE OF GRAVITY LIMITATIONS** ». Flight is permitted.

6.3.3 Example3

Item	Weight (kg)	Longitudinal arm (mm)	Lateral arm (mm)	Longitudinal moment (kg*mm)	Lateral moment (kg*mm)
Right skid scale indication	140.5	2 745	825	385 673	115 913
Left skid scale indication	141.5	2 745	-825	388 418	-116 738
Right door (-3.5 kg if removed)	0	2020	560	0	0
Left door (-3.5 kg if removed)	0	2020	-560	0	0
Pilot (right hand seat)	80	1985	245	158 800	19 600
Passenger (left hand seat)	75	1985	-245	148 875	-18 375
Auxiliary fuel tank (1.6 kg if fitted)	0	2490	340	0	0
Weight & arms (no fuel)	**437**	**2 475**	**1**	1 081 765	400
Fuel in main tank	12.6	2490	-340	31 374	-4 284
Fuel in auxiliary tank	0	2490	340	0	0
Weight & arms (with fuel)	**449.6**	**2 476**	**-9**	1 113 139	-3 884

In this example, the take-off weight is no more that the MTOW and the total longitudinal and lateral arms both with take-off fuel and with fuel empty are within the envelope defined in section « **2.8 CENTRE OF GRAVITY LIMITATIONS** ». Flight is permitted.

SECTION6 — WEIGHT AND BALANCE

6.3.4 Example4

Item	Weight (kg)	Longitudinal arm (mm)	Lateral arm (mm)	Longitudinal moment (kg*mm)	Lateral moment (kg*mm)
Right skid scale indication	140.5	2 745	825	385 673	115 913
Left skid scale indication	141.5	2 745	-825	388 418	-116 738
Right door (-3.5 kg if removed)	0	2020	560	0	0
Left door (-3.5 kg if removed)	0	2020	-560	0	0
Pilot (right hand seat)	80	1985	245	158 800	19 600
Passenger (left hand seat)	30	1985	-245	59 550	-7 350
Auxiliary fuel tank (1.6 kg if fitted)	1.6	2490	340	3 884	544
Weight & arms (no fuel)	**393.6**	**2 532**	**30**	996 424	11 969
Fuel in main tank	24.5	2490	-340	61 005	-8 330
Fuel in auxiliary tank	24.5	2490	340	61 005	8 330
Weight & arms (with fuel)	**442.6**	**2 527**	**27**	1 118 434	11 969

In this example, the take-off weight is no more that the MTOW and the total longitudinal and lateral arms both with take-off fuel and with fuel empty are within the envelope defined in section « **2.8 CENTRE OF GRAVITY LIMITATIONS** ». Flight is permitted.

6.3.5 Example5

Item	Weight (kg)	Longitudinal arm (mm)	Lateral arm (mm)	Longitudinal moment (kg*mm)	Lateral moment (kg*mm)
Right skid scale indication	140.5	2 745	825	385 673	115 913
Left skid scale indication	141.5	2 745	-825	388 418	-116 738
Right door (-3.5 kg if removed)	0	2020	560	0	0
Left door (-3.5 kg if removed)	0	2020	-560	0	0
Pilot (right hand seat)	100	1985	245	198 500	24 500
Passenger (left hand seat)	0	1985	-245	0	0
Auxiliary fuel tank (1.6 kg if fitted)	1.6	2490	340	3 984	544
Weight & arms (no fuel)	**383.6**	**2 546**	**63**	976 574	24 219
Fuel in main tank	24.5	2490	-340	61 005	-8 330
Fuel in auxiliary tank	24.5	2490	340	61 005	8 330
Weight & arms (with fuel)	**432.6**	**2 539**	**56**	1 098 584	24 219

In this example, the take-off weight is no more that the MTOW and the total longitudinal arms are within the envelope defined in section « **2.8 CENTRE OF GRAVITY LIMITATIONS** **»**.However, the total lateral arm will fall outside the envelope as fuel is consumed. Flight is not permitted.

SECTION6 — WEIGHT AND BALANCE

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SECTION7 — OPERATIONS ANDMAINTENANCE

CONTENTS SECTION 7

SECTION7 — OPERATIONS ANDMAINTENANCE

7.1 GENERAL

This section contains recommended procedures for operation, handling and maintenance of the helicopter.

The owner and the operator must remain in close contact with an approved distributor in order to remain permanently informed of the latest experience and advice specific to the aircraft.

CH7 HELISPORT S.r.l. holds the owner and the operator of the helicopter responsible for its maintenance. The owner and the operator must ensure that the maintenance is performed by suitably qualified and experienced individuals and in accordance with all publications issued by CH7 HELISPORT S.r.l.

All limitations, procedures, safety practices, hour limits and time limits, servicing and maintenance requirements specified in this manual are to be considered obligatory.

SECTION7 — OPERATIONS ANDMAINTENANCE

7.2 REQUIRED DOCUMENTS

The following documents must be carried on board the aircraft at all times.

1 Any documents (such as registration, airworthiness, identification and insurance documents)that are legally required by the country of registration.

2 Aircraft Log Book

3 Pilot’s Operating Handbook

4 Weight and Balance Schedule

5 Check-list

The following documents must be kept available for consultation by the pilot before flight.

1 Maintenance Manual

2 Maintenance Log

SECTION7 — OPERATIONS ANDMAINTENANCE

7.3 REQUIRED INSPECTIONS AND MAINTENANCE

CH-7 HELISPORT S.r.l. requires the following inspections and maintenance:

1 Complete inspection, rectification work as required and initial main and tail rotor tracking and balancing and other adjustments before the first flight of every newly assembled CH-77 Ranabot, as specified in the latest version of the maintenance manual, followed by test flights by a pilot approved by CH-7 HELISPORT S.r.l. This procedure must be performed by an approved agent of CH-7 HELISPORT S.r.l.

2 Daily Inspection as described in section « 4.2 DAILY INSPECTIONS».This inspection must be performed by the pilot after having received training organised by an approved agent of CH-7 HELISPORT S.r.l.

3 Maintenance after only the first 25 hours of flight as specified in the latest version of the maintenance manual. This maintenance may be performed by the owner and/or operator after having received training organised by an approved agent of CH-7 HELISPORT S.r.l.

4 Maintenance after each 50 hours of flight as specified in the latest version of the maintenance manual. This maintenance may be performed by the owner and/or operator after having received training organised by an approved agent of CH-7 HELISPORT S.r.l.

5 Maintenance after each 100 hours of flight as specified in the latest version of the maintenance manual. This maintenance must be performed by an approved agent of CH-7 HELISPORT S.r.l.

6 Maintenance every 12 months as specified in the latest version of the maintenance manual. This maintenance must be performed by an approved agent of CH-7 HELISPORT S.r.l.

7 Maintenance 12 Years as specified in the latest version of the maintenance manual. This maintenance must be performed by an approved agent of CH-7 HELISPORT S.r.l.

SECTION 7 — OPERATIONS AND MAINTENANCE

7.4 PILOT SAFETY TRAINING

7.4.1 Helisport Safety Course

In order to reduce the number of accidents that are mainly caused by pilot error, the FAA published a document SFAR73 that addresses specific characteristics inherent to the operation of certain light two bladed helicopters. These characteristics include potential, kinetic and rotor energy management, mast bumping, rotor stall, dangers due to low rotor speeds, and dangers due to low or negative g-forces.

The CH-77Ranabot is an example of this type of helicopter, and CH-7 HELISPORT S.r.l. considers that the terms of SFAR73 applies to all versions of the CH-77Ranabot.

Before assuming the functions of aircraft commander, each pilot must have completed training that covers all of the themes specified in SFAR73, addressing the particular characteristics of the CH-77 Ranabot.

Accordingly, CH-7 HELISPORT S.r.l. requires that all pilots acting as aircraft commander hold a certificate of successful completion of the “Helisport Safety Course” given by a training organisation approved byCH-7 HELISPORT S.r.l. This certificate has a validity of 2 years. (See per section 2.9 Operation Limitation)

7.4.2 Ranabot Left Seat Instructor Pilot Course

Normal flight configuration is that the pilot and flight commander occupies the right hand seat and the passenger occupies the left hand seat.(solo fly only right seat)

In order to exercise the functions of flight commander from the left hand seat, the occupant must hold a certificate of successful completion of the “Ranabot Left Seat Pilot Instructor Course” given by a training organisation approved by CH-7 HELISPORT S.r.l. This certificate has a validity of 2 years. (See per section 2.9 Operation Limitation)

SECTION7 — OPERATIONS ANDMAINTENANCE

7.5GROUND HANDLING

7.5.1 Introduction

The operator must be familiar with the correct procedures for ground handling before moving the helicopter or transporting it on a trailer, otherwise the aircraft could suffer serious damage.

7.5.2 Using the Standard Wheels

The standard wheels are designed for moving the aircraft on a hard smooth surface, but are not appropriate for use on grass. Before mounting these wheels on the skids check the tail is clear of any obstacle and that the canopy is latched. While mounting the standard wheels the aircraft can pivot suddenly onto the tail and the tail rotor guard can strike the ground.

7.5.3 Using the Optional Long Arm Wheels

The optional long arm wheels are designed for moving the aircraft on all surfaces. Before mounting these wheels on the skids check the tail is clear of any obstacle and that the canopy is latched. While mounting the standard wheels the aircraft can pivot suddenly onto the tail and the tail rotor guard can strike the ground.

SECTION 7 — OPERATIONS ANDMAINTENANCE

7.5.4 Moving the Helicopter

The operator may follow one of the two following procedures to move the helicopter:

1 Stand next to the tail boom and move the helicopter by holding the tail boom support attachment collar.
2 Stand behind the tail rotor and move the helicopter by holding the tail gearbox with one hand and the tail rotor guard with the other.

CAUTION:	Do not push on either of the two tail boom supports.

7.5.5 Transport on a Trailer

The trailer must be designed for loads in the order of 300 kg. Trailers designed for cars have stiffer suspension matched for much higher loads, which can inflict unacceptable stresses on the helicopter structure. The helicopter must be transported with the nose in the direction of travel. The trailer must be equipped with a support for the forward blade. The optional support available from CH-7 HELISPORT S.r.l. must be used to support the aft blade. Secure the blades with an angle of 2° above the horizontal and with the tail rotor vertical. The supports must be attached at no more that 50 cm from the blade tips and must not contact the trim tabs (if fitted). Secure the helicopter to the trailer by the skids near each undercarriage leg. set the tail rotor in vertical position ,no latched the tail rotor with any type of lock, leave the articulation hinge free.

CAUTION:	1	Never transport the helicopter by vehicle without blade supports correctly installed. If necessary, remove the blades. (Refer to the construction manual).
	2	Never transport the helicopter by vehicle with the helicopter covers in place. The relative wind can cause the covers to damage the windscreen, the paintwork and the blades.

SECTION7 — OPERATIONS ANDMAINTENANCE

7.6PARKING

The helicopter should be parked away from the general public and preferably in a dry and sheltered environment. If the helicopter must be parked outside in windy conditions attach the rear blade to the tail boom with a strap. Should the helicopter be parked outside for an extended period, use the optional protective covers. Should the helicopter be parked outside under sun cover the instruments panel with sun shade.

7.7CLEANING

To clean the exterior of the helicopter, use a mild well-diluted detergent in water.

Never use high-pressure water on the helicopter. To clean the engine and electrical components, carefully use compressed air.

SECTION7 — OPERATIONS AND MAINTENANCE

7.8 CHECK-LISTS

PROCEDURE BEFORE ENGINE START

Fuel level:	Visual check
Aircraft exterior:	remove :ground wheels,rotor ties,cowlings closed
Radio and headset:	On
Master switch:	Checklist(follow voice check list, buttons Next Back)
TCU light	On 2 secs then Off (#SA-R 914 engine only)
Previous flight time:	Check log
Warning lights: Oil, (fuel pres #), gov, gen,(alt,tcu*):	On (*SA-R 917 engine only) (#SA-R 914 engine only)
Seatbelts:	Fasten
Doors:	Closed and latched, emergency release
Fuel cock:	On (SA-R 914 only)
Fuel level:	Sufficient - EMS set
Cyclic & collective frictions:	Off
Cyclic, collective and pedals:	Full and free travel
Collective:	Full down, friction on
Cyclic:	Neutral, friction on
Pedals:	Neutral
All switches:	Off
Breakers:	In
Altimeter:	Set
Frame pressure:	2 bar

(#SA-R 914 engine only)

SECTION7 — OPERATIONS ANDMAINTENANCE

7.8 CHECKLISTS

START UP PROCEDURE

Choke:	On if engine cold(SA-R914only)
Master:	Run
Oil, gov, gen,(Alt,Tcu*) warning lights:	On (*SA-R917 Ti only)
Fuel pump 1:	Check pressure
Fuel pump 2:	On, check pressure increase, then off.
Throttle:	Closed
Area:	Clear
Starter collective Button:	Press, oil pressure light off(1bar approximately)
Ignition switch:	« R » then « BOTH », press Start Button.
Engine speed:	Between 1 800 rpm and 2 650 rpm (50%).
Clutch:	On, check clutch light on, note time.
Alternator:	On. Check volts
Choke:	Off(SA-R 914 only)
Clutch light:	Off. Check running time 90 secs.
Transponder:	Switch to Standby (if fitted).
Engine oil temperature:	35°C
Engine / rotor speed:	Increase to 70% - 80%
Check circuits:	Turn key from BOTH to R Check speed drop less than 150 rpm Turn key from BOTH to L Check speed drop less than 150 rpm
Ignition key:	BOTH
Engine oil temperature:	50°C
Engine / rotor speed:	90%
Throttle:	Cut
Tachometer:	Needles split
Engine / rotor speed:	1 800 rpm minimum

7.8 CHECK-LISTS

TAKE OFF PROCEDURE

Doors:	Closed and latched and 2 point Lock
Fuel cock:	Open
Choke:	Off(SA-R 914 only)
Fuel pump 2:	On
Breakers:	Set
Warning lights:	Check on then off
Cyclic and collective frictions:	Off
Engine oil temperature:	50°C
Engine / rotor speed:	90%
Governor:	On, check 104%
Outside temperature:	Check« SECTION 5 – PERFORMANCES »
Engine parameters:	Check
Wind:	Check
Area:	Clear
Radio:	Volume and frequency Set
Reduce rotor speed on at 96 %.	Check voice alarm and warning light
Release throttle	Check 104%

READY FOR TAKE OFF

7.8 CHECK-LISTS

SHUT DOWN PROCEDURE

Collective:	Full down
Collective friction:	On
Governor:	Off
Engine / rotor speed:	Reduce to 70 - 80%, 1 minute.
Trims:	Neutral
Fans:	On
Fuel pump 2:	Off
Engine / rotor speed:	Reduce to 50%,60secs after 1st reduction
Cyclic friction:	On
CHT and engine oil temperature:	Below 90°C
Clutch:	Off, check clutch light on, 40 secs
Ignition L R switch:	Off 40 secs after clutch motor start
Master switch:	Check List position
Alternator:	Off
Fans:	Off
Clutch light:	Off. Check running time 100 secs.
Master switch:	Off and all Switch off
Flight time	Note in log.

SECTION8 — SAFETY NOTICES

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SECTION8 — SAFETY NOTICES

CONTENTS SECTION 8 (cont)

SECTION8 — SAFETY NOTICES

8.1GENERAL

The Safety Notices contained within this section have been issued as a result of various incidents and accidents related to light helicopters.

SECTION8 — SAFETY NOTICES

8.2DYNAMIC ROLLOVER

A dynamic rollover can occur whenever the landing gear contacts a fixed object, forcing the aircraft to pivot about the object instead of about its own centre of gravity. The fixed object can be any obstacle or surface which prevents the skid from moving sideways.

Once started, dynamic rollover cannot be stopped by application of opposite cyclic alone. For example, assume the right skid contacts an object and becomes the pivot point while the helicopter starts rolling to the right.Even with full left cyclic applied, the main rotor thrust vector will still pass on the left side of the pivot point and produce a rolling moment to the right instead of to the left. The thrust vector and its moment will follow the aircraft as it continues rolling to the right. Quickly applying down collective is the most effective way to stop a dynamic rollover.

To avoid a dynamic rollover:

1 Always practice hovering autorotations into the wind and never when the wind is gusty or over 10 knots.
2 Never hover close to fences, sprinklers, bushes, runway lights or other obstacles a skid could catch on.
3 Always use a two-step liftoff. Raise the collective just enough to be light on the skids and feel for equilibrium, then gently lift the helicopter into the air.
4 Do not practice hovering manoeuvres close to the ground.
5 Keep the skids at least five feet above the ground when practising sideward or rearward flight.

SECTION8 — SAFETY NOTICES

8.3FATAL ACCIDENTS DUE TO ROTOR STALL (LOW RPM)

A primary cause of fatal accidents in light helicopters is failure to maintain rotor speed. To avoid this, every pilot must have his reflexes conditioned so he will instantly add throttle and lower collective to maintain rotor speed in any emergency.

Even when going down into rough terrain, trees, wires or water, he must force himself to lower the collective to maintain rotor speed until just before impact. The aircraft may roll over and be severely damaged, but the occupants have an excellent chance of walking away from it without injury.

Power available from the engine is directly proportional to rotor speed. If the rotor speed drops by 10%, there will be 10% less power. With less power, the helicopter will start to settle, and if the collective is raised to stop it from settling, the rotor speed will be pulled down even lower, causing the aircraft to settle even faster. If the pilot not only fails to lower collective, but instead pulls up on the collective to keep the aircraftfrom going down, the rotor will stall almost immediately. When it stalls, the blades will either “blow back” and cut off the tailcone or it will just stop flying, allowing the helicopter to fall at an extreme rate. In either case, the resulting crash is likely to be fatal.

No matter what causes the low rotor speed, the pilot must first roll on throttle and lower the collective simultaneously to recover rotor speed before investigating the problem. It must be a conditioned reflex. In forward flight, applying aft cyclic to bleed off airspeed will also help recover lost rotor speed.

8.4LOW G PUSHOVERS ARE EXTREMELY DANGEROUS

Pushing the cyclic forward following a pull-up or rapid climb, or even from level flight, produces a low-G (or weightless) flight condition.

If the helicopter is still pitching forward when the pilot applies aft cyclic to reload the rotor, the rotor disc may tilt aft relative to the fuselage before it is reloaded. The main rotor torque reaction will then combine with tail rotor thrust to produce a powerful right rolling moment on the fuselage. With no lift from the rotor, there is no lateral control to stop the rapid right roll and mast bumping can occur. Severe in-flight mast bumping usually results in main rotor shaft separation and/or rotor blade contact with the fuselage.

The rotor must be reloaded before lateral cyclic can stop the right roll. To reload the rotor, apply an immediate gentle aft cyclic, but avoid any large aft cyclic inputs. (The low-G which occurs during a rapid autorotation entry is not a problem because lowering collective reduces both rotor lift and rotor torque at the same time.)

Never attempt to demonstrate or experiment with low-G manoeuvres, regardless of your skill or experience level. Even highly experienced test pilots have been killed investigating the low-G flight condition. Always use great care to avoid any manoeuvre which could result in a low-G condition. Low-G mast bumping accidents are almost always fatal.

NEVER PERFORM A LOW-G PUSHOVER

8.5DO NOT ATTACH OBJECTS TO THE SKIDS

The landing gear has cracked on several helicopters when the pilot attempted to carry an external load strapped to the landing gear skids. The landing gear is optimized to take high "up" loads. Consequently, it has very low strength in the opposite or "down"direction. Also, even a small weight attached to the landing gear may change the natural frequency enough to cause high loads due to inflight vibration. Do not attempt to carry any external load or object attached to the landing gear.

SECTION8 — SAFETY NOTICES

8.6FUEL EXHAUTION CAN BE FATAL

Many pilots underestimate the seriousness of fuel exhaustion. Running out of fuel is the same as a sudden total engine or drive system failure.

When that occurs, the pilot must immediately enter autorotation and prepare for a forced landing(see section « 3.1 POWER FAILURE »). If autorotation is not entered immediately, the rotor speed will rapidly decay, the rotor will stall, and the results will probably be fatal. Serious or fatal accidents have occurred as a result of fuel exhaustion.

To ensure this does not happen to you, observe the following precautions:

1 Never rely solely on the EMS or the low fuel warning light. These electromechanical devices have questionable reliability in any airplane or helicopter. Always record the hourmeter reading each time the fuel tanks are filled.

2 During your preflight:

- a Check the fuel level in the tanks visually.
- b Ensure the fuel caps are tight.
- c Drain a small quantity of fuel from each tank and the gascolator to check for water or other contamination.

3 Before takeoff:

- a Ensure that the fuel valve is full on.
- b Plan your next fuel stop so you will have at least 20 minutes of fuel remaining.

4 In flight:

- a Continually check both hourmeter and the EMS fuel gauge.
  Lf either indicates low fuel, land immediately.
- b NEVER allow the fuel quantity to become so low in flight that the low fuel warning light comes on.

SECTION8 — SAFETY NOTICES

8.7POWER LINES ARE DEADLY

Flying into wires, cables, and other objects is by far the number one cause of fatal accidents in helicopters. Pilots must constantly be on the alert for this very real hazard.

1 Watch for the pylons; you will not see the wires in time.

2 Fly directly over the pylons when crossing power lines.

3 Allow for the smaller, usually invisible, grounding wire(s) which are well above the larger more visible wires.

4 Constantly scan the higher terrain on either side of your flight path for pylons.

5 Always maintain at least 500 ft AGL except during take-off and landing. By always flying above 500 ft AGL, you can virtually eliminate the primary cause of fatal accidents.

SECTION8 — SAFETY NOTICES

8.8NEVER EXIT THE HELICOPTER WITH THE ENGINE RUNNING

Several accidents have occurred when pilots momentarily left their helicopters unattended with the engine running and rotors turning. The collective can creep up, increasing both pitch and throttle, allowing the helicopter to lift off or roll out of control.

SECTION8 — SAFETY NOTICES

8.9HOLD CONTROLS WHEN BOARDING PASSENGERS

It is important to firmly grip both cyclic and throttle while loading or unloading passengers with the engine running in case they inadvertently bump the controls or slide across the throttle, rolling it open.

8.10NEVER LAND IN TALL DRY GRASS

The engine exhaust is very hot and can easily ignite tall grass or brush.

Helicopters have been completely destroyed by fire after a normal landing in tall grass.

8.11LOSS OF VISIBILITY CAN BE FATAL

Flying a helicopter in obscured visibility due to fog, snow, low ceiling, or even a dark night can be fatal. Helicopters have less inherent stability and much faster roll and pitch rates than aeroplanes. Loss of the pilot's outside visual references, even for a moment, can result in disorientation, wrong control inputs, and an uncontrolled crash. This type of situation is likely to occur when a pilot attempts to fly through a partially obscured area and realizes too late that he is losing visibility.

He loses control of the helicopter when he attempts a turn to regain visibility but is unable to complete the turn without visual references.

You must take corrective action before visibility is lost! Remember, unlike the aeroplane, the unique capability of the helicopter allows you to land and use alternative transport during bad weather, provided you have the good judgement and necessary willpower to make the correct decision.

SECTION8 — SAFETY NOTICES

8.12OVERCONFIDENCE PREVAILS IN ACCIDENTS

A personal trait most often found in pilots having serious accidents is overconfidence.

High-time fixed-wing pilots transitioning into helicopters and private owners are particularly susceptible. Aeroplane pilots feel confident and relaxed in the air, but have not yet developed the control feel, coordination, and sensitivity demanded by a helicopter.

Private owners have no boss and can fly without discipline, enforced rules, or periodic flight checks and critique by a chief pilot. A private owner must depend on self-discipline, which is sometimes forgotten.

When flown properly and conservatively, helicopters are potentially the safest aircraft built. But helicopters are also probably the least forgiving. They must always be flown defensively. The pilot should allow himself a greater safety margin than he thinks will be necessary, just in case.

8.13FLYING LOW OVER WATER IS DANGEROUS

Many helicopter accidents have occurred while manoeuvring low over water.

Many pilots do not realize their loss of depth perception when flying over water. Flying over calm glassy water is particularly dangerous, but even choppy water, with its constantly varying surface, interferes with normal depth perception and may cause a pilot to misjudge his height above the water.

MAINTAIN 500 FT AGL WHENEVER POSSIBLE AND AVOID MANOEUVRES OVER WATER BELOW 200 FT AGL.

8.14 DEMONSTRATION OR INITIAL TRAINING FLIGHTS

A disproportionate number of fatal and non-fatal accidents occur during demonstration or initial training flights. The accidents occur because individuals other than the pilot are allowed to manipulate the controls without being properly prepared or indoctrinated.

If a student begins to lose control of the aircraft, an experienced flight instructor can easily regain control provided the student does not make any large or abrupt control movements. If, however, the student becomes momentarily confused and makes a sudden large control input in the wrong direction, even the most experienced instructor may not be able to recover control. Instructors are usually prepared to handle the situation where the student loses control and does nothing, but they are seldom prepared for the student who loses control and does the wrong thing.

Before allowing someone to touch the controls of the aircraft, they must be thoroughly indoctrinated concerning the extreme sensitivity of the controls in a light helicopter. They must be firmly instructed to never make a large or sudden movement with the controls. And, the pilot-in-command must be prepared to instantly grip the controls should the student start to make a wrong move.

SECTION8 — SAFETY NOTICES

8.15 REDUCE VERTICAL SPEED BEFORE REDUCING AIRSPEED

Many helicopter accidents have been caused by the pilot reducing his airspeed to near zero during an approach before reducing his rate-of-descent.

As the pilot then raises the collective and flares to stop his rate-of-descent, he flares into his own downwash, greatly increasing the power and collective pitch required. The aircraft begins to enter the vortex ring state (settling-with-power) and a hard landing occurs, often followed by a rollover. This can occur during a steep approach either power-on or power-off.

This can be avoided by always reducing your rate-of-descent before reducing your airspeed. A good rule to follow is never allow your airspeed to be less than 30 mph until the rate-of~descent is less than 300ft/min.

8.16 THE ROTORS CAN KILL

Non-pilot passengers have been killed by inadvertently walking into a rotating main rotor or tail rotor. Every possible precaution must be taken by the pilot to prevent this tragic type of accident. The main rotor blades can easily descend below head height especially in windy conditions, if the helicopter is parked on even a slight slope, or if the cyclic is not properly centred. The tail rotor is just as dangerous for anyone passing near the rear of the helicopter. The following rules should always be observed:

- Never allow anyone to approach the helicopter unless they are escorted or have been properly instructed. If necessary, shut down and stop rotors before boarding passengers.
- Always have strobe light flashing when rotors are turning.
- Passengers must only approach the helicopter while maintaining a low crouch position.
- Instruct passengers to establish and maintain eye contact with pilot when approaching the helicopter. (This will force them to approach only from the nose or side, never the tail).
- Instruct passengers to leave the helicopter in full view of the pilot and move only around the nose, never the tail.
- Be especially careful when landing away from airfields as unseen children or adults might approach the helicopter from the rear.

SECTION8 — SAFETY NOTICES

8.17 LOW RPM ROTOR STALL CAN BE FATAL

Rotor stall due to low rotor speed causes a very high percentage of helicopter accidents, both fatal and non-fatal. Frequently misunderstood, rotor stall is not to be confused with retreating blade stall which occurs only at high forward speeds when stall occurs over a small portion of the retreating blade. Retreating blade stall causes vibration and control problems, but the rotor is still very capable of providing sufficient lift to support the weight of the helicopter.

Rotor stall, on the other hand, can occur at any airspeed and when it does, the rotor stops producing the lift required to support the helicopter and the aircraft literally falls out of the sky. Fortunately, rotor stall accidents usually occur close to the ground during takeoff or landing and the helicopter falls only four or five feet. The helicopter is wrecked but the occupants survive. However, rotor stall can also occur at higher altitudes and when it happens at heights above 40 or 50 ft AGL it is most likely to be fatal.

Rotor stall is very similar to the stall of an aeroplane wing at low airspeeds. As the airspeed of an aeroplane gets lower, the nose-up angle, or angle-of-attack, of the wing must be higher for the wing to produce the lift required to support the weight of the aeroplane. At a critical angle (about 15 degrees), the airflow over the wing will separate and stall, causing a sudden loss of lift and a very large increase in drag.

The aeroplane pilot recovers by lowering the nose of the aeroplane to reduce the wing angle-of-attack below stall and adds power to recover the lost airspeed.

The same thing happens during rotor stall with a helicopter except it occurs due to low rotor speed instead of low airspeed. As the speed of the rotor reduces, the angle-of-attack of the rotor blades must be higher to generate the lift required to support the weight of the helicopter. Even if the collective is not raised by the pilot to provide the higher blade angle, the helicopter will start to descend until the upward movement of air to the rotor provides the necessary increase in blade angle-of-attack. As with the aeroplane wing, the blade airfoil will stall at a critical angle, resulting in a sudden loss of lift and a large increase in drag. The increased drag on the blades acts like a huge rotor brake causing the rotor speed to rapidly decrease, further increasing the rotor stall. As the helicopter begins to fall, the upward rushing air continues to increase the angle-of-attack on the slowly rotating blades, making recovery virtually impossible, even with full down collective.

SECTION8 — SAFETY NOTICES

8.17 LOW RPM ROTOR STALL CAN BE FATAL (cont)

When the rotor stalls, it does not do so symmetrically because any forward airspeed of the helicopter will produce a higher airflow on the advancing blade than on the retreating blade. This causes the retreating blade to stall first, allowing it to dive as it goes aft while the advancing blade is still climbing as it goes forward. The resulting low aft blade and high forward blade become a rapid aft tilting of the rotor disc sometimes referred to as "rotor blow-back". Also, as the helicopter begins to fall, the upward flow of air under the tail surfaces tends to pitch the aircraft nose-down. These two effects, combined with aft cyclic by the pilot attempting to keep the nose from dropping, will frequently allow the rotor blades to blow back and chop off the tailboom as the stalled helicopter falls. Due to the magnitude of the forces involved and the flexibility of rotor blades, rotor teeter stops will not prevent the boom chop. The resulting boom chop, however, is academic, as the aircraft and its occupants are already doomed by the stalled rotor before the chop occurs.

To prevent rotor stall and its catastrophic consequences thepilot must always do whatever is required to maintain a safe rotor speed. It must take precedence over all other considerations, even if it means landing in a swamp instead of trying to stretch the glide to the dry road beyond.

Remember the power output of the engine is proportional to rotor speed and when the rotor speed is low there is less power available from the engine with which to regain the lost rotor speed. The power on low RPM recevery procedure of simultaneously rolling on throttle while lowering collective must be practised until it becomes an automatic reaction to any indication of low rotor speed. Low airspeeds combined with high sink rates must always be avoided and full collective must never be pulled until the helicopter is within 1 ft of the ground.

8.18NIGHT FLIGHT IN POOR WEATHER CONDITIONS

Many fatal accidents have occurred at night when the pilot attempted to fly in marginal weather after dark. The fatal accident rate during night flight is many times higher than during daylight hours.

When it is dark, the pilot cannot see wires or the bottom of clouds, nor low hanging scud or fog. Even when he does see it, he is unable to judge its altitude because there is no horizon for reference. He doesn’t realize it is there until he has actually flown into it and suddenly loses his outside visual references and his ability to control the attitude of the helicopter. As helicopters are not inherently stable and have very high roll rates, the aircraft will quickly go out of control, resulting in a high velocity crash which is usually fatal.

Be sure you NEVER fly at night unless you have clear weather with unlimited or very high ceilings and plenty of celestial or ground lights for reference.

SECTION8 — SAFETY NOTICES

8.19 SURPRISE THROTTLE CHOPS CAN BE DEADLY

Many flight instructors do not know how to give a student a simulated power failure safely. They may have learned how to respond to a throttle chop themselves, but they haven't learned how to prepare a student for a simulated power failure or how to handle a situation where the student’s reactions are unexpected. The student may freeze on the controls, push the wrong pedal, raise instead of lower the collective, or just do nothing. The instructor must be prepared to handle any unexpected student reaction.

Before giving a simulated power failure, carefully prepare the student and be sure you have flown together enough to establish that critical understanding and communication between instructor and student. Go through the exercise together a number of times until the student’s reactions are both correct and predictable. Never truly surprise the student. Tell him you are going to give him a simulated power failure a few minutes before, and when you roll off the throttle, loudly announce “power failure". The manifold pressure should be less than 26 inches and the throttle should be rolled off smoothly, never "chopped". Follow through on all controls and tighten the muscles in your right leg to prevent the student from pushing the wrong pedal if he becomes confused. And always assume that you will be required to complete the autorotation entry yourself. Never wait to see what the student does. Plan to initiate the recovery within one second, regardless of the student’s reaction.

There have been instances when the engine has quit during simulated engine failures. As a precaution, always perform the simulated engine failure within glide distance of a smooth open area where you are certain you could complete a safe touch-down autorotation should it become necessary. Also, never practice simulated powerfailures until the engine is thoroughly warmed up. Wait until you have been flying for at least 15 to 20 minutes.

8.20 LISTEN FOR IMPENDING BEARING FAILURE

An impending ball or roller bearing failure is usually preceded by a noticeable increase in noise. The noise will typically start several hours before the bearing actually fails or before there is any increase in bearing temperature. To detect impending failure of a drive system bearing, the pilot should uncover one ear and listen to the sound of the drive system during start-up and shutdown. After the pilot becomes familiar with the normal sound of the drive system, he should be able to detect the noise made by a failing bearing. The failing bearing will produce a loud whine, rumble, growl, or siren sound. Upon hearing an unusual noise, the pilot must immediately ground the aircraft and have the bearings thoroughly inspected by a qualified mechanic.

Failure of a bearing in flight could result in a serious accident.

Do not rely on Telatemps to indicate impending bearing failure. A failing bearing may not run hot enough to black out the Telatemps until it actually starts to disintegrate. This may occur only seconds before complete failure.

SECTION8 — SAFETY NOTICES

8.21 AEROPLANE PILOTS FLYING HELICOPTERS

There have been a number of fatal accidents involving experienced pilots who have many hours in aeroplanes but with only limited experience flying helicopters.

The ingrained reactions of an experienced aeroplanepilot can be deadly when flying a helicopter. The aeroplanepilot may fly the helicopter well when doing normal manoeuvres under ordinary conditions when there is time to think about the proper control response. But when required to react suddenly under unexpected circumstances, he may revert to his aeroplanereactions and commit a fatal error. Under those conditions, his hands and feet move purely by reaction without conscious thought.

Those reactions may well be based on his greater experience, ie., the reactions developed flying aeroplanes.

For example, in an aeroplanehis reaction to a warning horn (stall) would be to immediately go forward with the stick and add power. In a helicopter, application of forward stick when the pilot hears a horn (low RPM) would drive the rotor speed even lower and could result in rotor stall, especially if he also "adds power" (up collective). In less than one second the pilot could stall his rotor, causing the helicopter to fall out of the sky.

Another example is the reaction necessary to make the aircraft go down. If the helicopter pilot must suddenly descend to avoid a bird or another aircraft, he rapidly lowers the collective with very little movement of the cyclic. In the same situation, the aeroplanepilot would push the stick forward to dive. A rapid forward movement of the helicopter cyclic under these conditions would result in a low "G" condition which could cause mast bumping, resulting in separation of the rotor shaft or one blade striking the fuselage. A similar situation exists when terminating a climb after a pull-up. The aeroplanepilot does it with forward stick. The helicopter pilot must use his collective or a very gradual, gentle application of forward cyclic.

To stay alive in the helicopter, the experienced aeroplanepilot must devote considerable time and effort to developing safe helicopter reactions. The helicopter reactions must be stronger and take precedence over the pilot’s aeroplanereactions because everything happens faster in a helicopter. The pilot does not have time to realize he made the wrong move, think about it, and then correct it. It’s too late; the rotor has already stalled or a blade has already struck the airframe and there is no chance of recovery. To develop safe helicopter reactions, the aeroplanepilot must practice each procedure over and over again with a competent instructor until his hands and feet will always make the right move without requiring conscious thought.

ABOVE ALL, HE MUST NEVER ABRUPTLY PUSH THE CYCLIC STICK FORWARD.

SECTION8 — SAFETY NOTICES

8.22 LOOSE OBJECTS CAN BE FATAL

Fatal accidents have occurred due to loose objects flying out of the cabin and striking the tail rotor.

Any object striking the tail rotor can cause failure of a tail rotor blade. Loss of or damage to a tail rotor blade may cause a severe out-of-balance condition which can separate the tail rotor gearbox or entire tail assembly from the tailcone, resulting in a catastrophic accident.

Accidents have also been caused by fuel caps, birds, and other objects striking the tail rotor.

Before each flight perform the following:

- Walk completely around the aircraft checking fuel cap security and tail rotor condition. Ensure no loose objects or debris are in the vicinty of the helicopter.
- Stow or secure all loose objects in the cabin. Even with doors on, items such as charts can be sucked out of a window.
- Instruct passengers regarding the dangers of objects striking the tail rotor. Warn them never to throw anything from the helicopter or place items near vent doors where they could get sucked out.
- Firmly latch all doors.
- Never fly with the left hand door removed. (Remove only the right hand door for ventilation.)

SECTION8 — SAFETY NOTICES

8.23HIGH WINDS AND TURBULENCE

Flying in high winds or turbulence should be avoided but if unexpected turbulence is encountered, the following procedures are recommended:

- Reduce airspeed to between 60 and 70 mph.
- Tighten seat belt and firmly rest right forearm on right leg to prevent unintentional control inputs.
- Do not overcontrol. Avoid large or abrupt control movements. Allow aircraft to go with the turbulence, then restore level flight with smooth gentle control inputs.
- Leave governor on and do not chase rotor speed or airspeed.Momentary RPM or airspeed excursions are to be expected.
- Avoid flying on the downwind side of hills, ridges, or tall buildings where the turbulence will probably be the most severe.
- Never fly into a blind or steep sidedvalley during high winds.

SECTION8 — SAFETY NOTICES

8.24 RISKS IN SURVEY OR PHOTO FLIGHTS

There is a misconception that aerial survey and photo flights can be flown safely by low time pilots. This is not true. There have been numerous fatal accidents during aerial survey and photographic flights.

Often, to please the observer or photographer, an inexperienced pilot will slow the helicopter to less than 30 mph and then attempt to maneuver for the best viewing angle. While manoeuvring, the pilot may lose track of airspeed and wind conditions. The helicopter can rapidly lose translational lift and begin to settle. An inexperienced pilot may raise the collective to stop the descent. This can reduce rotor speed thereby reducing power available and causing an even greater descent rate and further loss of rotor speed. Rolling on throttle will increase rotor torque but not power available due to the low rotor speed. Because tail rotor thrust is proportional to the square of the rotor speed, if the rotor speed drops below 80% nearly one-half of the tail rotor thrust is lost and the helicopter will rotate nose right. Suddenly the decreasing rotor speed also causes the main rotor to stall and the helicopter falls rapidly while continuing to rotate. The resulting impact is usually fatal.

Aerial survey and photo flights should only be conducted by well trained, experienced pilots who:

- Have at least 500 hours pilot-in-command in helicopters and over 100 hours in the model flown;
- Have extensive training in both low rotor speed conditions and settling-with-power recovery techniques;
- Are willing to refuse unsafe directions from the observer or photographer and only fly the aircraft at speeds, altitudes, and wind angles that are safe and allow good escape routes.

SECTION8 — SAFETY NOTICES

8.25 FLYING NEAR RADIO TRANSMISSION TOWERS

Electrical system malfunctions have occurred in aircraft when flying near high intensity radio transmission towers.

While transmission tower location and height are marked on aeronautical charts, transmitter power is not.

Early indications of a high power radio field include strong interference in the intercom system and aircraft radio receivers. Increasing field strength may cause random illumination of warning lights and erratic governor and tachometer operation. If the pilot has removed his hand from the collective to adjust the radio due to the interference, initial erratic operation of the governor may go unnoticed. Under these conditions, the governor may roll the throttle to idle or open it rapidly, overspeeding the engine and rotor.

The following precautions should be taken to reduce the risk from high power radio transmitters:

- Do not fly near radio transmission towers.
- Do not become distracted trying to adjust the radio or intercom to reduce interference. Keep one hand on the collective and throttle, and be prepared to switch off the governor and assume manual throttle control.
- Although permanent damage is unlikely, check electrical system thoroughly following a flight through a high power radio field.

8.26 EXCEEDING THE LIMITATIONS CAN BE FATAL

Many pilots do not understand metal fatigue.

Each time a metal component is loaded to a stress level above its fatigue limit, hidden damage occurs within the metal. There is no inspection method which can detect this invisible fatigue damage. The first indication will be a tiny microscopic crack in the metal, often hidden from view. The crack will grow with each repetition of the critical stress until the part suddenly breaks. Crack growth will occur quite rapidly in drive system parts from the high frequency torsional loads. It will also occur rapidly in rotor system components due to the high centrifugal force on the blades and hub. Damaging fatigue cycles occur with every revolution of an overloaded drive shaft or rotor blade.

If a pilot exceeds the power or airspeed limits on a few occasions without failure, he may be misled into believing he can safely operate at those high loads. This is not true. For every second the limitations are exceeded, more stress cycles occur and additional fatigue damage can accumulate within the metal. Eventually, a fatigue crack will begin and grow until a sudden failure occurs. If the pilot is lucky, the part will have reached its approved service life and be replaced before failure. If not, there will likely be a serious or fatal accident.

WARNING

- Always operate the aircraft well below its approved Vne (never exceed speed), especially in turbulent wind conditions.
- Do not operate the engine above its placarded manifold pressure limits.
- Do not load the aircraft above its approved gross weight limit.
- The most damaging conditions occur when flying or manoeuvring at high airspeeds combined with high power settings.

SECTION8 — SAFETY NOTICES

8.27 PRACTISE AUTOROTATIONS CAUSE MANY ACCIDENTS

Each year many helicopters are destroyed practicing for an engine failure that very rarely occurs.

Many practice autorotation accidents occur when the helicopter descends below 100 ft AGL without all the proper conditions having been met. As the aircraft descends through 100 ft AGL, make an immediate power recovery unless all of the following conditions exist:

- Rotor speed in middle of the green arc.
- Airspeed stabilized between 65 and 75 mph.
- A normal rate of descent, usually less than 1500 ft/min.
- Turns (if any) completed.

Instructors may find it helpful to call out "RPM, airspeed, rate of descent" prior to passing through 100 ft. At density altitudes above 4000 ft, increase the decision point to 200 ft AGL or higher.

A high percentage of training accidents occur after many consecutive autorotations. To maintain instructor focus and minimize student fatigue, limit practice to no more than 3 or 4 consecutive autorotations.

There have been instances when the engine has quit during practice autorotation. To avoid inadvertent engine stoppage, do not roll throttle to full idle. Reduce throttle smoothly for a small visible needle split, then hold throttle firmly to override governor. Recover immediately if engine is rough or engine speed continues to drop.

8.28 UNUSUAL VIBRATION – POSSIBLE BLADE CRACKS

A catastrophic rotor blade fatigue failure can be averted if pilots and mechanics are alert to early indications of a fatigue crack.

Although a crack may be internal to blade structure and not visible, it will likely cause a significant increase in rotor vibration prior to final failure. If a rotor is smooth after balancing but then goes out of balance again within a few flights, it should be considered suspect. Have the rotor system thoroughly examined by a qualified mechanic before further flight.

If main rotor vibration rapidly increases or becomes severe during flight, make an immediate safe landing. Do not attempt to continue flight to a convenient destination.

8.29FIRE AFTER AN ACCIDENT

There have been a number of cases where helicopter or light aeroplaneoccupants have survived an accident only to be severely burned by fire following the accident.

To reduce the risk of injury in a postcrash fire, it is strongly recommended that fire-retardant Nomex clothing or flight suit, gloves, and a hood or helmet be worn by all occupants.

SECTION8 — SAFETY NOTICES

8.30PILOT DISTRACTION

Distractions in the cabin have caused pilots to lose control of the helicopter. Reading charts, programming avionics, or attending to passengers are some common distractions.

During flight, it is important to keep eyes focused outside and minimize distractions to avoid an accident. Any avionics programming that takes more than a few seconds should be done while on the ground.

When hovering, keep both hands on the controls. If tuning a radio or other task is required, first land and reduce collective pitch.

When dealing with distractions in forward flight, reduce power, slow down, and frequently look outside to verify straight and level flight.

Occasionally, pilots neglect to latch a door before taking off. Never attempt to latch a door while hovering or in flight. It is safer to land before closing a door.

SECTION8 — SAFETY NOTICES

8.31UNANTICIPATED YAW

A pilot's failure to apply proper pedal inputs in response to strong or gusty winds during hover or low-speed flight may result in an unanticipated yaw.

Some pilots mistakenly attribute this yaw to loss of tail rotor effectiveness (LTE), implying that the tail rotor stalled or was unable to provide adequate thrust. The tail rotor on the CH-77 helicopter is unlikely to experience LTE.

To avoid unanticipated yaw, pilots should be aware of conditions (a left crosswind, for example) that may require large or rapid pedal inputs. Practicing slow, steady-rate hovering pedal turns will help maintain proficiency in controlling yaw. Hover training with a qualified instructor in varying wind conditions may also be helpful.

SECTION8 — SAFETY NOTICES

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