



FLIGHT MANUAL

PILOT'S OPERATING HANDBOOK

NATIONALITY- AND REGISTRATION MARKS	
DESIGNATION OF AIRCRAFT	SAFARI HELICOPTER
SERIAL NO	
YEAR OF MANUFACTURE	
MANUFACTURER	

This handbook shall always be carried onboard during flight.

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SECTION 1**NOTES:**

1. This Flight Manual applies only to the aircraft which Nationality and Registration Marks are noted on the title page.
2. It is the pilot's responsibility to be familiar with the contents of this Flight Manual including revisions and any relevant supplements.
3. These pages may not be exchanged and no alterations of or additions to the contents may be made without prior approval. The editor of this Flight Manual is responsible for the edition of amendments.
4. Amendments which effect the airworthiness of the aircraft will be announced in the publication issued by the manufacturer or by the EAA. The owner is responsible for incorporating prescribed amendments and should make notes about these on the record of amendments on page 7.

CONTROL LIST:

Page no	Date	Page no	Date
0-1	99.11.20		
0-2	99.11.20	4-1	99.09.25
0-3	99.11.20	4-2	99.09.25
0-4	99.11.20	4-3	99.09.25
0-5	99.11.20	4-4	99.09.25
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		4-6	99.09.25
1-1	99.09.25	4-7	99.09.25
1-2	99.09.25	4-8	99.09.25
1-3	99.09.25	4-9	99.09.25
1-4	99.09.25	4-10	99.09.25
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7-6.4	99.09.25	8-2	99.09.25
7-6.5	99.09.25	8-3	99.09.25
7-6.6	99.09.25	8-4	99.09.25
7-7	99.09.25	8-5	99.09.25
7-8	99.09.25	8-6	99.09.25
7-8.1	99.09.25	8-7	99.09.25
7-8.2	99.09.25	8-8	99.09.25
7-9	99.09.25		
7-10	99.09.25		

SECTION 2

GENERAL

INTRODUCTION

This Pilot's Operating Handbook is designed as an operating guide for the pilot. It includes the material required to be furnished to the pilot. It also contains supplemental data supplied by the helicopter kit manufacturer.

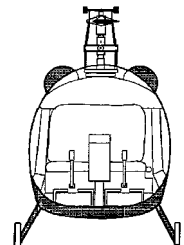
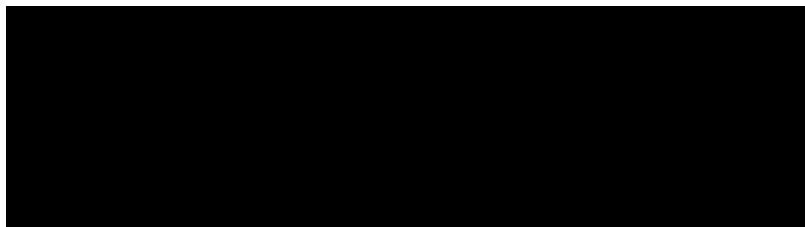
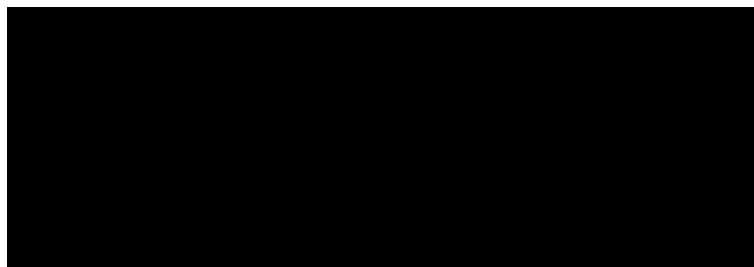
This handbook is not designed as a substitute for adequate and competent flight instruction or for knowledge of current air-worthiness directives, applicable federal air regulations and advisory circulars. Nor is it intended to be a guide for basic flight instruction or a training manual. It should not be used for operational purposes unless kept in current status.

Assuring that the helicopter is in airworthy condition is the responsibility of the owner. The pilot in command is responsible for the determining that the helicopter is safe for flight. The pilot is also responsible for remaining within the operating limitations as outlined by instrument markings, placards, and this handbook.

Since it is very difficult to refer to a handbook while flying a helicopter, the pilot should study the entire handbook and become very familiar with the limitations, performance, procedures and operational handling characteristics of the helicopter before flight.

This handbook has been divided into ten numbered sections. The limitations and emergency procedures have been placed ahead of the normal procedures, performance and other sections to provide easier access to that information. Provisions for expansion of the handbook have been made by the deliberate omission of certain paragraph numbers, figure numbers, item numbers and pages noted as being blank, intentionally.

THREE VIEW OF SAFARI HELICOPTER



DESCRIPTIVE DATA:

MAIN ROTOR:

Articulation	Free to teeter Rigid in plane
Number of Blades	2
Rotor Diameter	25' 11" (7,63 m)
Blade Chord	8" (203 mm)
Blade Twist	0°
Precone Angle	2°
Tip Speed @ 500 RPM	200 m/s

TAIL ROTOR:

Articulation	Free to teeter, Rigid in plane
Number of Blades	2
Rotor Diameter	4' (1,22 m)
Blade Chord	3.5" (102 mm)
Blade Twist	0°
Precone Angle	0°
Tip Speed @ 2750 RPM	175 m/s

DRIVE SYSTEM:

Engine to Main Transmission	Centrifugal Clutch with Integral Sprag Clutch
Drive line to Main Rotor	Helical Spur Gears with 5.5:1 Reducing ratio
Drive line Tail Rotor	Spiral Bevel Gears with 1:1 Ratio

POWERPLANT:

Model: Avco Lycoming O-320

Type: Four-cylinder, horizontally-opposed, direct-drive, air-cooled,
normally-aspirated, carburetor-equipped.

Displacement: 319.8 cubic inches.

Normal Rating:

O-320-A2B or A2C,	150 BHP@2700 RPM
O-320-B2C	160 BHP@2700 RPM

ENGINE COOLING:

Direct drive Multi-bladed Fan

FUEL:

Approved Fuel Grades and capacity: See page 17.

OIL:

Oil Grade during Brake-in: Use Mil-L-6082 aviation grade straight mineral oil to replenish the supply during the first 25 hours and at the first 25 hour oil change. Continue to use until oil consumption has stabilized or until a total of 50 hours has accumulated.

Oil Grade after Brake-in: Mil-L-22851 Ashless dispersant oil must be used after 50 hours or after the oil consumption has stabilized.

RECOMMENDED OIL VISCOSITY:

Average Ambient Air Temperature	Mil-L-6082 Straight Mineral Oil	Mil-L-22851 Ashless Dispersant Oil
Above 16°C (60°F)	SAE 50	SAE 40 or 50
-1°C to 32°C (30°F to 90°F)	SAE 40	SAE 40
-18°C to 21°C (0°F to 70°F)	SAE 30	SAE 40 or 30
Below -12°C (10°F)	SAE 20	SAE 30

OIL SUMP CAPACITY: 8 U.S. Quarts (7,6 liters)

SEE AVCO LYCOMING O-320 OPERATOR'S MANUAL FOR ADDITIONAL INFORMATION

ABBREVIATIONS AND DEFINITIONS:**PERFORMANCE ABBREVIATIONS:**

KIAS:	Knots Indicated Airspeed is the speed shown on the Airspeed Indicator corrected for Instrument error expressed in knots.
KCAS:	Knots Calibrated Airspeed is the speed shown on the Airspeed Indicator corrected for Instrument and position error expressed in knots.
KTAS:	Knots True Airspeed is the airspeed in knots, relative to the undisturbed air. It is the KCAS corrected for pressure altitude and temperature.
Vne:	Never Exceed Airspeed.
Vy:	Speed for Best Rate-of-Climb.
MSL:	Is the height in feet above sea level shown by the Altimeter Altitude: (corrected for position and instrument error) when the barometric pressure is set to that existing at sea level.
Pressure:	Is the altitude in feet indicated by the Altimeter (corrected for position Altitude: and instrument error) when the barometric pressure is set at 29.92" of mercury.
Density:	Is the altitude in feet having the same air density as exists on a Altitude: standard ISA day. (It is the pressure altitude corrected for OAT)
ISA:	International Standard Atmosphere exists when the pressure at sea level is 29.92" of mercury, the temperature is 15°C and decreases 1.98°C per 1000 feet of altitude.
BHP:	Brake Horsepower is the actual power output of the engine.
GPH:	Gallons Per Hour of fuel consumed by the engine.
MAP:	Manifold Pressure is the absolute pressure in inches of mercury in the engine intake manifold.
RPM:	Revolutions Per Minute or speed of the engine or main rotor.
MCP:	Maximum Continuous Power.
Takeoff Power:	Maximum power for 5 minutes
CAT:	Carburetor Air Temperature
CHT:	Cylinder Head Temperature
AGL:	Above Ground Level
IGE:	In Ground Effect
OGE:	Out of Ground Effect
ALT:	Alternator
MPH:	Miles Per Hour
Nr:	Rotor RPM
Ne:	Engine RPM (In Multi-Engine aircraft, e is replaced with the Engine number, ie. N ₁ is #1 Engine RPM)

WEIGHT AND BALANCE DEFINITIONS:

Reference	An imaginary vertical plane from which all horizontal Datum distances are measured for balance purposes.
Station	A location along the helicopter fuselage usually given in terms of distance in inches from the reference datum.
Arm	The horizontal distance from the reference datum to the center of gravity (C.G.) of an item.
Moment	The product of the weight of an item multiplied by its arm. (Moment divided by a constant is used to simplify balance calculations by reducing the number of digits.)
Center of Gravity (C. of G.)	The point at which a helicopter would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the helicopter.
C.G. Arm	The arm from the reference datum obtained by adding the helicopter's individual moments and dividing the sum by the total weight.
C.G. Limits	The extreme center of gravity locations within which the helicopter must be operated at a given weight.
Usable Fuel	Fuel available for flight planning.
Unusable Fuel	Fuel remaining after a runout test has been completed in accordance with governmental regulations.
Standard Empty Weight	Weight of a standard helicopter including unusable fuel, full Weight operating fluids and full oil.
Basic Empty Weight	Standard empty weight plus optional equipment.
Payload	Weight of occupants, cargo and baggage.

CONVERSION TABLES:

METRIC TO ENGLISH

<u>Multiply</u>	<u>By</u>	<u>To Obtain</u>
centimeters (cm)	.3937	inches (in)
kilograms (kg)	2.2046	pounds (lb)
kilometers (km)	.5400	nautical miles (nm)
kilometers (km)	.6214	statute miles (mi)
liters (l)	.2642	gallons, U.S. (gal)
liters (l)	1.0567	quarts (qt)
meters (m)	3.2808	feet (ft)

ENGLISH TO METRIC

<u>Multiply</u>	<u>By</u>	<u>To Obtain</u>
feet (ft)	.3048	meters (m)
gallons, U.S. (gal)	3.785	liters (l)
inches (in)	2.540	centimeters (cm)
inches (in)	25.40	millimeter (mm)
nautical miles (nm)	1.852	kilometers (km)
pounds (lb)	.4536	kilograms (kg)
quarts (qt)	.9464	liters (l)
statute miles (mi)	1.6093	kilometers (km)

SECTION 3

LIMITATIONS

GENERAL

This section includes operating limitations, instrument marking and basic placards required for the safe operation of the helicopter, its engine and other standard systems.

COLOR CODE FOR INSTRUMENT MARKINGS

- Red Indicates operating limits. The pointer should not enter the red during normal operation.
- Yellow Cautionary operating range.
- Green Normal operating range.

AIRSPEED LIMITATIONS

NEVER-EXCEED AIRSPEED (Vne)

Up to 3000 feet density altitude 100 MPH.

AIRSPEED INDICATOR MARKINGS

Red line at 100 MPH

ROTOR SPEED LIMITS

Power On	
Maximum	500 RPM
Minimum	450 RPM

Power Off	
Maximum	500 RPM
Minimum	400 RPM

ROTOR TACHOMETER MARKINGS

Green Arc	450 - 500 RPM
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POWERPLANT LIMITATIONS

ENGINE

One Lycoming Model O-320

OPERATING LIMITATIONS

Engine Speed, Maximum	3000 RPM
Cylinder Head Temperature	500°F (260°C)
Oil Temperature	245°F (118°C)
Oil Pressure	
Minimum during idle	25 psi
Minimum during flight	60 psi
Maximum during start & warm-up	90 psi
Maximum during flight	80 psi
Alternator Max Load	35 amps

Manifold Pressure (See charts on page18 for MAP schedules)

POWERPLANT INSTRUMENT MARKINGS

OIL PRESSURE

Lower red line	20 psi
Green Arc	60 to 80 psi
Upper red line	80 psi

OIL TEMPERATURE

Green arc	140 to 245°F
Red line	245°F

CYLINDER HEAD TEMPERATURE

Red line	500°F
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ENGINE TACHOMETER

Red line	3000 RPM
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TRANSMISSION TEMPERATURE

Red line	220°F
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CARBURETOR AIR TEMPERATURE GAUGE

Yellow arc 5° to 41° F

MANIFOLD PRESSURE

Red line 25,9 in Hg
Yellow arc 23,2 to 25,9 in Hg

WEIGHT LIMITS:

Maximum gross weight 1500 lbs. (680 kg)

Maximum Cabin Capacity 400 lbs. (181 kg)

Minimum solo pilot weight 130 lbs. (59 kg)

Ballast must be in the correct position before flight.

CENTER-OF-GRAVITY (CG) LIMITS

(See figures on page 16)

Datum line is 91 inches (231,1 cm) forward of
Aft Skid leg (station 91)

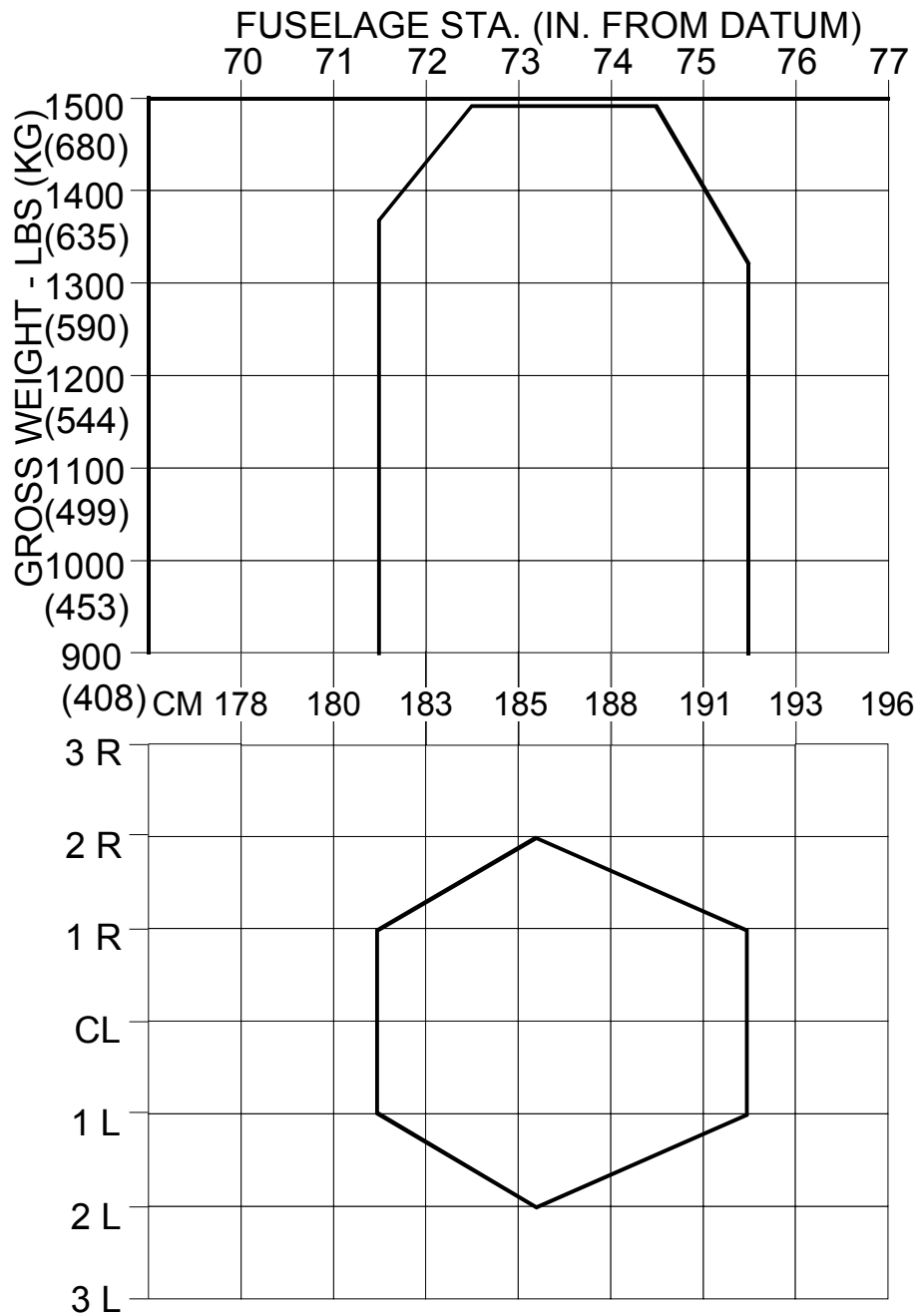
Forward CG limit 71,5 inches (181,6 cm) aft of datum

Aft CG limit 75,5 inches (191,8 cm) aft of datum

Left CG limit 2,0 inches (5,1 cm) left of ship center

Right CG limit 2,0 inches (5,1 cm) right of ship center

CENTER OF GRAVITY LIMITS



FLIGHT AND MANEUVER LIMITATIONS

Acrobatic flight is prohibited.

Use maximum power-on RPM during take-off, climb, or level flight below 500 feet AGL or above 5,000 feet density altitude.

Flight during icing condition is prohibited.

Maximum operating density altitude is 14,000 feet.

Solo flight from left seat.

Right seat belt must be buckled.

Doors-off operation approved with either or both doors removed.

CAUTION

No loose items allowed in cabin during flight.

CAUTION

Avoid abrupt pull-ups or push-overs in forward flight. When a pull-up (aft cyclic) is followed by a push-over (forward cyclic), a weightless (low-G) condition may occur. If the aircraft starts to roll during this condition, *gently* apply aft cyclic to reduce the weightless feeling *before* using lateral cyclic to stop the roll.

KINDS OF OPERATION LIMITATIONS

IFR flight prohibited.

VFR day is approved.

VFR night operation is permitted only when landing, navigation, instrument and anti-collision lights are installed and operable. Orientation during night flight must be maintained by visual reference to ground objects illuminated by lights on the ground or adequate celestial illumination.

FUEL LIMITATION

Approved Fuel Grades 80/87 or 100 LL grade aviation fuel.

Fuel Capacity

Dual tank total capacity 28 U.S. Gallons (106 lit.)

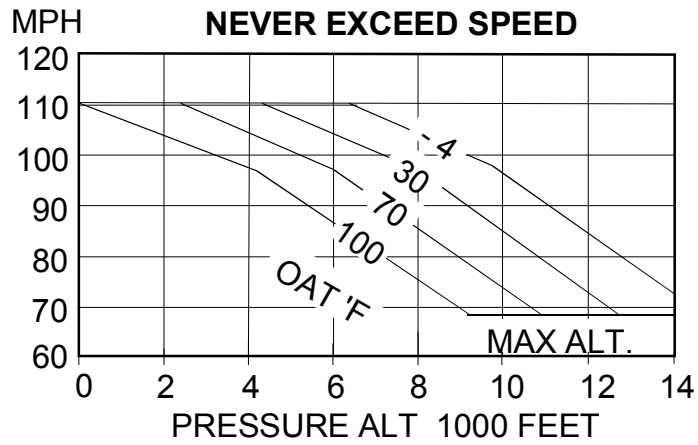
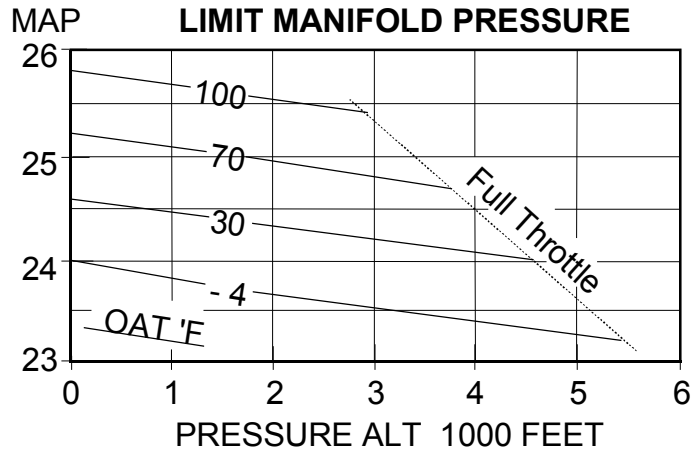
Dual tank usable capacity 26.6 U.S. Gallons (101 lit.)

PLACARDS:

In clear view of the pilot:

THIS ROTORCRAFT APPROVED FOR VFR
OPERATIONS ONLY

In clear view and readable by pilot in flight:



PLACARDS (cont'd)

Located near fuel tank filler cap:

Fuel
80/87 Min. Grade Aviation Gasoline
Cap: 28 U.S. Gal.

Located near shut-off valve:

FUEL
ON - OFF

Located near tank fuel gage:

28 U.S. Gal.

Located near heater push-pull control when heater is installed.

In case of Engine Fire
Push Heater Control to Off

Located in clear view of both occupants:

NO SMOKING

PLACARDS (cont'd)

Located in clear view of pilot:

Minimum Solo Pilot Weight 130 lbs. (59 kg)

Located inside each baggage compartment:

Do not exceed any of the following:	
Compartment capacity:	50 lb (23 kg) max
Each seat plus compartment:	240 lb (109 kg) max
Or Rotorcraft gross weight limit..	

Located on carburetor air temperature gage:

<p style="text-align: center;">CAUTION</p> <p>Below 18 in. MP ignore gage and apply full carb heat.</p>
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SECTION 4

EMERGENCY PROCEDURES

GENERAL

The information contained in Section 4 is suggested by CANADIAN HOME ROTORS INC.

POWER FAILURE - GENERAL

1. A power failure may be caused by either an engine or drive system failure.
2. An engine failure may be indicated by a change in noise level, nose right yaw, OIL pressure light or decreasing engine RPM.
3. A drive system failure may be indicated by an unusual noise or vibration, nose left or right yaw, decreasing rotor RPM while engine RPM is increasing.

CAUTION

Aft cyclic is required when collective is lowered at high speed and forward C.G.

POWER FAILURE ABOVE 500 FEET AGL

1. Lower collective immediately to maintain RPM and enter normal autorotation.
2. Establish a steady glide at approximately 60 MPH. (See "Maximum Glide Distance Configuration", page 22.)
3. Adjust collective to keep rotor RPM in green arc, or, full down if lightweight prevent attaining min. 400 RPM.
4. Select landing spot and if altitude permits, maneuver so landing will be into wind.
5. A restart may be attempted at pilot's discretion if sufficient time is available. ("Air Restart Procedure", page 22)
6. If unable to restart, turn off unnecessary switches and shut-off fuel.
7. At about 40 feet AGL, begin cyclic flare to reduce forward speed.
8. At about 8 feet AGL, apply forward cyclic to level ship and increase collective to stop decent. Touch down in level attitude with nose straight ahead.

CAUTION

Avoid using aft cyclic during touchdown or during ground slide.

NOTE

If power failure occurs at night, do not turn on landing lights above 1000 feet AGL; this preserves battery power.

POWER FAILURE BETWEEN 8 FEET AND 500 FEET AGL

1. Take-off operation should be conducted per the Height-Velocity Diagram in Section 6 - pg.32.
2. If power failure occurs, lower collective immediately to maintain rotor RPM.
3. Adjust collective to keep rotor RPM in green arc, or, full down if lightweight prevent attaining min. 400 RPM.
4. Maintain airspeed until ground is approached then begin cyclic flare to reduce forward speed.
5. At about 8 feet AGL, apply forward cyclic to level ship and start raising collective to stop decent. Touchdown with skid level and nose straight ahead.

CAUTION

Avoid using aft cyclic during touchdown or during ground slide.

POWER FAILURE BELOW 8 FEET AGL

1. Apply left pedal as required to prevent yawing.
2. Allow rotorcraft to settle.
3. Increase collective just before touchdown to cushion landing.

MAXIMUM GLIDE DISTANCE CONFIGURATION

1. Airspeed approximately 60 MPH.
2. Rotor RPM approximately 450 RPM.
3. Best glide ratio is about 4,5:1 or $\frac{3}{4}$ nautical miles per 1000 feet AGL.

CAUTION

Increase rotor RPM to 500 RPM when autorotating below 500 feet AGL.

AIR RESTART PROCEDURE

1. Mixture - full rich.
2. Throttle - off, then cracked slightly.
3. Actuate starter with left hand.

CAUTION

Do not attempt restart if engine malfunction is suspected or until safe autorotation is established.

DITCHING - POWER OFF

1. Follow same procedures as for engine failure over land until contacting the water.
2. Apply lateral cyclic when ship contacts the water to stop the blades from rotating.
3. Release seat belt and quickly clear aircraft when blades stop rotating.

DITCHING - POWER ON

1. Descend to hover above water.
2. Unlatch doors.
3. Passenger exit aircraft.
4. Fly to safe distance from passenger to avoid possible injury by blades.
5. Switch off battery and alternator.
6. Close throttle.
7. Keep aircraft level and apply full collective as it contacts water.
8. Apply lateral cyclic to stop blades from rotating.
9. Release seat belt and quickly clear aircraft when blades stop rotating.

LOSS OF TAIL ROTOR THRUST DURING FWD FLIGHT

1. Failure is usually indicated by nose left yaw which cannot be corrected by applying right pedal.
2. Immediately enter autorotation and select a landing site.
3. Maintain at least 70 MPH minimum airspeed if altitude permits.
4. A small amount of collective and power may be added to extend glide if sideslip is not excessive and aircraft does not tend to spiral.
5. Use right cyclic and adjust collective to limit sideslip angle.
6. Select final landing site, roll off throttle and perform autorotation landing.

LOSS OF TAIL ROTOR THRUST DURING HOVER

1. Failure is usually indicated by nose left yaw which cannot be corrected by applying right pedal.
2. Immediately close throttle and perform hovering power-off landing.
3. Keep ship level and increase collective just before touchdown to cushion landing.

FIRE IN FLIGHT

1. Enter autorotation.
2. Master bat switch - Off (if time permits).
3. Cabin heat - Off (if installed and time permits).
4. Cabin vent - On (if time permits).
5. If engine is running, perform normal landing and immediately shut-off fuel valve.
6. If engine stops running, shut-off fuel valve and execute autorotation landing.

ENGINE FIRE DURING START ON GROUND

1. Cranking - Continue, to get start which would suck flames and excess fuel through carburetor into engine.
2. If engine starts, run at 1500 RPM for a short while, shutdown, and inspect for damage.
3. If engine fails to start, turn-off fuel an master bat switch.
4. Extinguish fire with fire extinguisher, wool blanket or dirt.
5. Inspect for damage.

ELECTRICAL FIRE IN FLIGHT

1. Master bat switch - Off.
2. Alt switch - Off.
3. Land immediately.
4. Extinguish fire and inspect for damage.

TACHOMETER FAILURE

If Rotor or Engine tach goes to zero in flight, use the remaining tach to make a normal landing.

NOTE

Each tach are on separate circuits. Even if the Master Bat switch is off, the Rotor and Engine tach is still working. No external power source in needed for this function.

RED WARNING LIGHTS

When a red warning light comes on, select the nearest safe landing area and make a normal landing as soon as practical. Prepare for possible power-off landing. If warning light comes on during night flight, the light can be dimmed by tuning the lens counterclockwise, to eliminate glare during landing.

MR CHIP	Indicates possible malfunction or deterioration in main rotor gear box.
TR CHIP	Indicates possible malfunction or deterioration in tail rotor gear box.
OIL PRESS	Indicates possible loss of engine power or oil pressure. Check engine tach and oil pressure damage to engine and engine failure could occur.

NOTE

When gear boxes are new, break-in fuzz will occasionally activate chip light and should lessen in frequency during the initial 50 hours. If light comes on and no metal chips or slivers are found on detector plug, drain and refill box with new oil. Hover close to ground for at least one hour.

AMBER CAUTION LIGHTS

LOW FUEL (OPTIONAL) Comes on when there is approximately one gallon of fuel remaining. The engine may run out of fuel within five minutes at rated power.

CAUTION

Do not use LOW FUEL caution light as a working indication of fuel quantity.

LOW VOLT (OPTIONAL) Light indicates low voltage and possible alternator failure. Turn off nonessential electrical equipment, switch ALT off and back on after one second to reset over-voltage protection. If light stays on, terminate flight as soon as practical.

SECTION 5

NORMAL PROCEDURES

GENERAL

The information contained in Section 5, Normal Procedures, is suggested by CANADIAN HOME ROTORS INC.

AIRSPEDS FOR SAFE OPERATION

Take-off & Climbs	60 MPH
Maximum Rate-of-Climb (Vy)	53 MPH
Maximum Range	83 MPH
Landing Approach	65 MPH
Autorotation	60 MPH

DAILY OR PREFLIGHT CHECKS

Remove any temporary covers and in cold weather remove even small accumulations of frost, ice or snow. Check maintenance records to be sure aircraft is airworthy. During the following inspection, check the general condition of the aircraft and also look for any evidence of leakage, discoloration due to heat, dents, chaffing, galling, nicks, corrosion and especially for cracks. Also check for fretting at seams where parts are joined together. Fretting of aluminum parts produces a fine black powder, while steel produces a reddish brown or black residue.

Engine left side

- Cooling shroud..... No cracks
- Cooling fan..... No cracks
- Gascolator..... Drain (check for water)
- Fuel/Oil leaks..... Check
- Alternator V-Belt tension..... Check
- Exhaust system..... No cracks
- Steel frame..... No cracks
- Engine oil..... 6-8 qts.
- Fuel/Oil hoses..... No leaks or chafing

Fuel tank left side

- Leakage..... None
- Quantity..... Check
- Filler cap..... Tight
- Drain..... Check

Main Rotor

- Gear box oil level..... Check
- Constant velocity coupling (tail rotor shaft)..... Check
- Steel tube joints..... No cracks
- Control rod ends..... Free without looseness
- Swashplate bearings..... No looseness
- Blades..... Clean and no damage/cracks
- Rotor Head..... No cracks
- All bolts and fasteners..... Tight
- Over-running clutch..... Blades turn freely CCW

Tail boom

- Steel tube joints..... No cracks
- Bearings (tail rotor drive shaft)..... No cracks
- Strobe light condition..... Check
- Antenna..... Check
- Vertical fin..... No cracks

DAILY OR PREFLIGHT CHECKS (cont'd)

Tail Rotor

- Aft flex coupling..... Check
- Horizontal stabilizer..... No cracks
- Gearbox Oil level..... Check
- Swash plate bearings..... No looseness
- Rod ends..... Free without looseness
- Rotor head..... No cracks
- Blades..... Clean and no damage/cracks
- Delta pin bearing..... Looseness

Engine right side

- Inlet air duct..... Check
- Carb heat box..... No cracks
- Carb air inlet duct..... Check
- Oil cooler..... No oil leaks
- Cooling shroud..... No cracks
- Oil hoses..... No leaks or chafing

Fuel tank right side

- Leakage..... None
- Quantity..... Check
- Filler cap..... Tight
- Drain..... Check

Fuselage right side

- Landing gear..... Check
- Ground handling wheels..... Removed
- Position light..... Check
- Door hinge safety pin..... As required
- Ballast weight..... Correct position

Nose Section

- Windshield condition & cleanliness..... Check
- Pitot tube..... Clear

Fuselage left side

- Landing gear..... Check
- Ground handling wheels..... Removed or secured for flight
- Position light..... Check
- Door hinge safety pin..... As required

Cabin interior

- Battery..... Secure
- Condition of seat belts..... Check
- Fuel quantity with Master bat switch on..... Check
- Condition of instruments, switches and controls..... Check
- Remove any tools or other loose articles from cabin..... Check

CAUTION

Avoid placing hard objects in baggage compartments which could injure occupants if seat collapses during a hard landing.

BEFORE STARTING ENGINE

- Doors (if installed)..... Closed
- Seat belts on..... Check
- Pedals..... Check, then neutral
- Cyclic / Collective..... Full travel free
- Cyclic / Collective..... Locked
- All switches / Avionics..... Off
- Fuel shut-off valve..... Open
- Master switch..... On
- Circuit breakers (instruments)..... In
- Instruments..... Check
- Warning lamps..... Check
- Magneto switch..... Left magneto
- Mixture..... Full rich
- Carb heat..... Off
- Throttle..... Closed
- Maximum MAP..... Calculate

STARTING ENGINE

- Primer..... 0 - 4 strokes
- Area..... Clear
- Starter switch..... Engage/Release
- Magneto switch..... Both
- Strobe light..... On
- Alternator..... On
- Maximum idle RPM..... 1500 RPM
- Bat. Charge..... Check amp. meter
- Oil pressure in 30 sec..... 25 psi
- Clutch engaging..... Engine idle
- Warm-up RPM..... 1500 - 1700 RPM

ENGINE CHECK

- Engine 1700 RPM..... Adjust
- Pressure / Temp..... Green area
- Mag drop..... Check
- Sprag clutch check..... Needle split

TAKE-OFF PROCEDURE

- Avionics On
- Unlock controls
- Bring rotor RPM up slowly. At approximately 400 RPM, pull some collective to arrest vibration.
- Continue to 490 RPM.
- Slowly raise collective, rolling off throttle as required to keep RPM in middle of green arc. Near sea level the throttle correlation will compensate for collective changes when the manifold pressure reaches about 19 in. Hg. At higher elevations some throttle may be required with collective.
- Lower nose and accelerate to climb speed following profile shown by H-V Diagram in Section 6 – pg. 32. Keep rotor RPM at top of green arc during take-off and climb out.

CRUISE

- Set rotor RPM in upper one-half of green arc 450 - 475 RPM).

CAUTION

In-flight leaning with engine mixture control is not recommended. Engine stoppage may result as there is no propeller to keep engine turning should over-leaning occur.

PRACTICE AUTOROTATION - POWER RECOVERY

(Below 4.000 feet)

- Without changing throttle setting, lower collective to down stop.
- Raise collective as required to keep rotor RPM from going above green arc and adjust throttle for needle separation.
- Keep RPM in green arc and airspeed 60-65 MPH
- At about 40 feet AGL, begin cyclic flare to reduce forward speed.
- At about 8 feet AGL, apply forward cyclic to level ship and raise collective to stop descent. Add throttle as required to keep RPM in green arc.

PRACTICE AUTOROTATION - POWER RECOVERY

(Above 4.000 feet)

- Same as below 4.000 feet except throttle must be reduced slightly before lowering collective and increased slightly when collective is raised.

PRACTICE AUTOROTATION - WITH GROUND CONTACT

If practice autorotations with ground contact are required for demonstration purposes, they should be performed in the same manner as the power recovery autorotation except:

Prior to the cyclic flare, roll the throttle off into the stop and hold it there until the autorotation is complete. This prevents the throttle correlation from adding power when the collective is raised.

Always contact ground with skids level and nose straight ahead.

CAUTION

The SAFARI helicopter has a relatively light, low-inertia rotor system. Most of the energy which is used for completing a successful autorotation is stored in the forward momentum of the aircraft and not in the rotor. Therefore, a well-timed cyclic flare is required and rotor RPM kept in the green until just before ground contact.

CAUTION

During simulated engine failures, a rapid decrease in rotor RPM will occur requiring immediate lowering of collective control to avoid dangerously low rotor RPM. Simulated engine failures should be conducted from 490 RPM. Catastrophic rotor stall occur if the rotor RPM ever droops below 390 RPM plus 5 RPM per 1000 feet of altitude.

USE OF CARBURETOR HEAT

When conditions conducive to carburetor ice are known or suspected, such as fog, rain, high humidity, or when operating near water, use Carb heat as follows:

During hover or cruise flight above 18 inches MAP, apply Carb heat as required to keep the CAT gage out of the yellow arc. If an unexplained drop in manifold pressure or RPM occurs, apply full Carb heat for about one minute and check for an increase in MAP or RPM.

During autorotation or reduced power below 18 inches MAP apply full Carb heat regardless of CAT gage temperature. When power is reapplied, return Carb heat control to full cold or partial heat position. Additional information is given in the Lycoming Operator's Manual.

CAUTION

CAT gage is only effective above 18 inches MAP. During descents or autorotation under conditions conducive to Carb ice, ignore gage and apply full Carb heat.

APPROACH AND LANDING

- Make final approach into the wind at the lowest practical rate-of- descent with an initial airspeed of 65 MPH.
- Reduce airspeed and altitude smoothly to hover. Be sure that rate-of-descent is less than 300 FPM before the airspeed is reduced below 30 MPH.
- From hover, reduce collective pitch gradually to ground contact.
- After initial ground contact, reduce collective to full down position.

CAUTION

When landing on a slope, return the cyclic control to neutral before final reduction of rotor RPM.

SHUT-DOWN

- Collective Down..... Lock On
- Cyclic / Pedals Neutral..... Lock On
- Idle 1500 RPM (1 minute)..... Head temp drop
- Avionics..... Off
- Idle 1000 RPM..... Adjust
- Mixture..... Pull to stop
- Magneto switch..... Off
- Switches..... Off
- Alternator..... Off
- Master switch..... Off
- Fuel shut-off valve..... Closed

CAUTION

Do not slow rotor by raising collective during shut-down. Blades may flap and strike tail boom.

NOISE ABATEMENT

To improve the quality of our environment and to dissuade the public from enacting overly restrictive ordinances against helicopters, it is imperative that every pilot produce the lowest possible noise irritation to the general public while operating his helicopter. The following are several quieting techniques which should be employed when possible.

- Avoid flying over outdoor concerts, ballgames or other assemblies of people. When it cannot be avoided, fly as high as practicable, preferably over 2,000 feet AGL.
- Avoid blade slap. Blade slap usually occurs during shallow high speed descents, especially during turns. If can be avoided by using slower, steeper descents. With the left door removed, the pilot can easily determine those flight conditions which produce blade slap and develop piloting techniques which will eliminate or reduce this very irritating source of noise.
- When departing from or approaching to a landing site, avoid prolonged flight at low altitude near residential neighborhoods, schools, hospitals and other noise sensitive areas.
- Repetitive noise is far more irritating than a single occurrence. If you must fly over the same area more than once, vary your flight path so you don't over-fly the same buildings each time.

NOTE

The above recommended procedures do not apply where they would conflict with Air Traffic Control clearances or instructions or when in the pilot's judgment they would result in an unsafe flight path.

SECTION 6

PERFORMANCE

GENERAL

Hover controllability has been substantiated in 17 kt. winds from any direction up to 10,600 feet density altitude. Refer to IGE hover performance data for allowable gross weight.

Use maximum power-on RPM during take-off and during level flight below 500 feet AGL or above 5,000 feet density altitude.

Indicated airspeed (MPH) shown on graphs assumes zero instrument error.

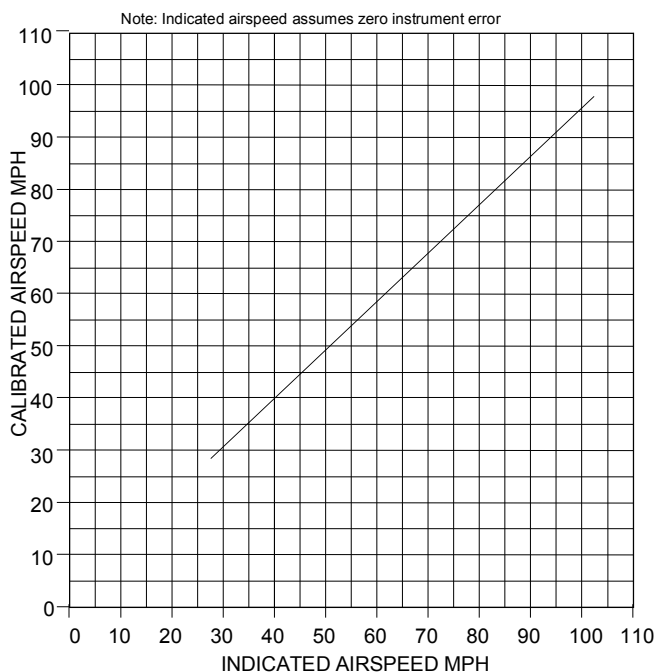
CAUTION

The performance data presented in this section was obtained under ideal conditions. The performance under other conditions may be substantially less. Hover performance data was obtained with carburetor heat OFF.

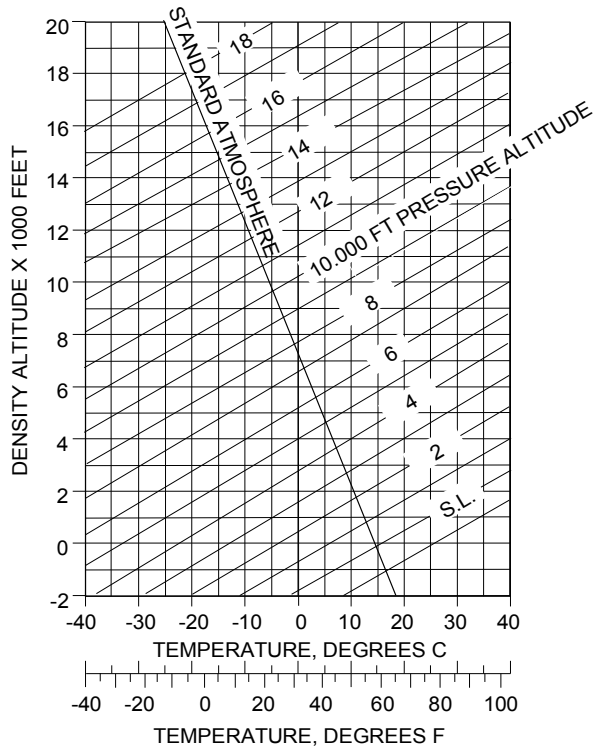
DEMONSTRATED OPERATING TEMPERATURE

Satisfactory engine cooling has been demonstrated to an outside air temperature of 38 °C (100 °F) at sea level or 23 °C (41 °F) above standard ISA at altitude.

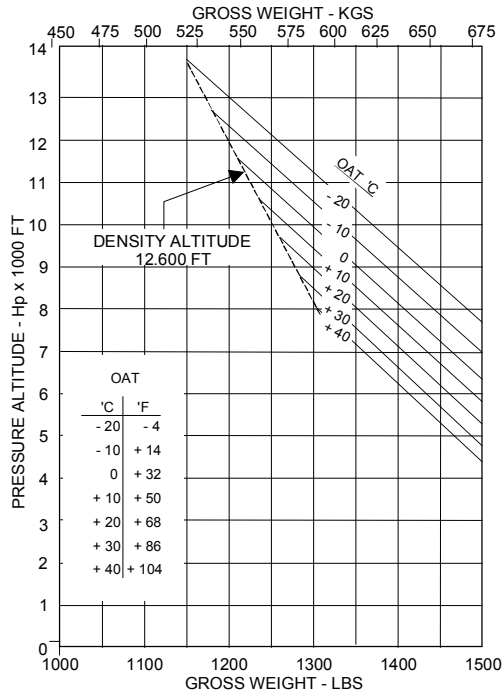
AIRSPEED CALIBRATION CURVE CHART



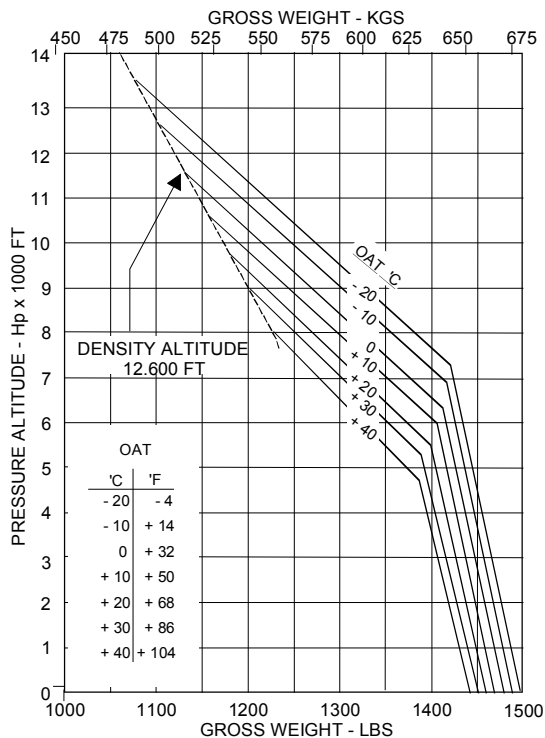
DENSITY ALTITUDE CHART



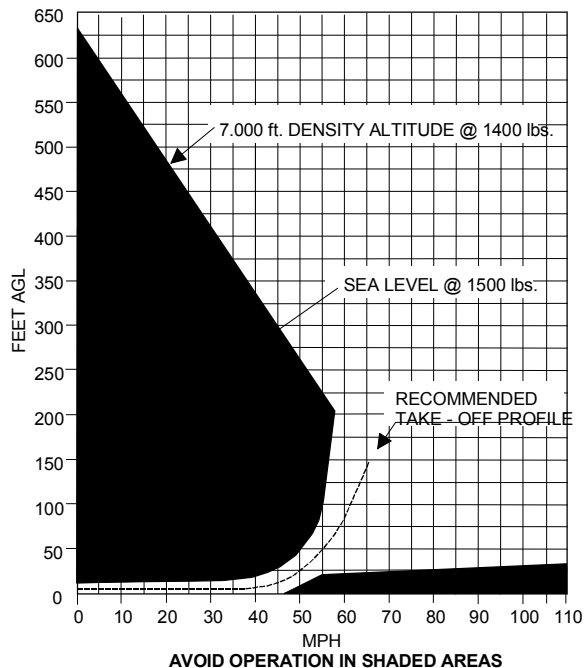
IGE HOVER CEILING VS. GROSS WEIGHT CHART



OGE HOVER CEILING VS. GROSS WEIGHT CHART



HEIGHT-VELOCITY DIAGRAM CHART



SECTION 7

WEIGHT AND BALANCE

GENERAL

The helicopter must only be flown within weight and balance limits specified. Loading outside these limits can result in insufficient control travel for safely controlling the helicopter.

The longitudinal weight and balance limits specified in Section 3 are expressed in this section as total moments. The total moments can be determined using the method given below.

CAUTION

The fuel is not located at the CG of this helicopter and a change in CG location will occur during flight. Always determine the safe loading with empty fuel as well as with take-off fuel. The amount of fuel which can be off-loaded to allow for a greater payload is limited by the forward CG location with empty fuel.

HELICOPTER WEIGHING PROCEDURES

1. Preparing of Aircraft:
 - a. Drain fuel using drain on gascolator or by disconnecting the flex hose to the carburetor.
 - b. Fill engine oil and gearboxes to full marks.
 - c. Install and secure both doors.
 - d. Be sure all checked items on equipment list are installed in their proper locations.
 - e. Be sure aircraft is clean and remove any foreign items such as charts, tools or rags.
 - f. Mark helicopter equipment list to show exactly which equipment is installed.
2. Hoist aircraft using 3/4 inch diameter soft nylon rope (minimum tensile strength of 1,000 lbs.) wrapped around the main rotor head making sure that the rope doesn't bind to the yoke.
3. Have one man hold tail of helicopter, while it is being hoisted, to stabilize aircraft.
4. Check that the main rotor blades are oriented fore and aft.
5. Prepare 2 ea. angle pieces 1" x 1", length 10". Place a angle piece (inverted) under each skid, approximately at STA 80.
6. Carefully lower the aircraft until it rests on the supports. For protection, place a piece of 1/4" x 1" steel bar under each skid. Adjust until aircraft is in balance, still holding the tail.
7. Mark the position (Empty center of gravity) on each skid.
8. Raise aircraft and place >500 lbs. capacity weight scales under each skid. Locate center of scales at the previous marked position.
9. Lower aircraft until it rests entirely on scales. Aircraft must be well balanced on scales before releasing tail. Be sure aircraft is level laterally by placing a level on center of tube aft main gearbox.
10. Record empty weight.

R Scale _____ lb.

L Scale _____ lb.

Tare _____ lb.

Empty Weight _____ lb.

BASIC EMPTY WEIGHT & C.G.			
ITEM	Weight (lb.)	C.G. Arm** (In.)	Moment* (lb.-in.)
Ship as weighed (from step 10)			
Add drained unusable fuel			
Helicopter Basic Empty Weight (Includes unusable fuel & full oil)			

*Moment = Weight x C.G. Arm

**Arm measured from Datum located 91 inches forward of rear skid leg.

LATERAL CG POSITION

It is usually not necessary to determine the lateral CG position as most optional equipment is located near the helicopter centerline. However, if an unusual installation or loading occurs which could affect the lateral CG, its position should be checked against the CG envelope contained in Section 3 – pg. 16. The lateral CG position can be calculated by multiplying the weight of all items, not symmetrical about the centerline, times their arm from the centerline. Then considering all items on the right as positive and those on the left as negative, sum the moments and divide the total by the weight of the loaded helicopter. This will give you the lateral position which, together with the CG position aft of the datum, can be compared with the allowable CG envelope in Section 3 – pg. 16.

When weighing the helicopter, the center distance between the skids must be accurately measured while the ship is resting on the scales. The lateral CG position equals: (R scale reading - L scale reading) x 1/2 Distance between skids - (R scale reading + L scale reading).

The following CG locations may be used when determining the helicopter CG position.

Item	Long CG	Lat. CG
Pilot & Baggage under L seat	50.0	
Passenger & Baggage under R seat	50.0	
Fuel	80.0	
Cargo Hook	69.0	
Doors	42.0	

SECTION 8

SYSTEMS DESCRIPTION

AIRFRAME

The **SAFARI** is a two-place, single main rotor, single engine helicopter constructed primarily of steel tubing and equipped with skid type landing gear.

The primary structure of the fuselage is welded steel tubing and riveted aluminum for the engine shroud and cabin area. The tailboom is a welded steel tubing, truss type design.

The cabin doors are removable by the hinge pins.
The seats hinges up and aft for access to the battery and the flight control mixing system,

The instrument panel has the front and left side removable for access to the circuit breakers and wiring.

ROTOR SYSTEMS

Main Rotor

The rotor system on the **SAFARI** Helicopter is a two-bladed, all-metal or composite, semi-rigid teetering design. The all metal blade skins are riveted and bonded to a extruded 7075-T6 aluminum leading edge spar. The two-bladed system has the freedom in what is called the See-Saw plane. This system allows the rotor freedom spanwise to rock over a central bearing, known as the See-Saw bearing. This allows the system to tilt as required to establish a component of lift and thrust for directional control and balance. This type of rotorhead is provided with a bearing parallel to the rotor blades to allow for feathering of the blades. This has the effect of mounting the rotor system on a universal joint. The purpose of such a mounting is to relieve the drive shaft from secondary bending moments due to gyroscopic forces imposed by tilting the rotor disc, and the aerodynamic forces encountered in forward flight. Both the See-Saw bearing and Feathering bearing are mounted in a plane with the vertical center of gravity of the rotor system, the dynamic center of gravity rather than static center of gravity.

Tail Rotor

The tail rotor blades, unlike the main rotor blades, has a steel tube spar in the center of the blade, and are otherwise hollow stainless steel. This allows some flexing under thrust, as there can be no coning angle machined into the spindle, as forces may either be negative or positive. The tail rotor system has collective pitch, and is pivoted on a delta pin, as common practice with most helicopters. This method causes the advancing blade to automatically change pitch to maintain the symmetrical thrust forces and remove any gyroscopic force from the system.

DRIVE SYSTEM

The engine is installed in a vertical position with the centrifugal clutch assembly bolted integrally to the prop boss. The assembly, including clutch shoes, offers some fly wheel dampening to the engine. The clutch shoes engage the inside of a aluminum drum that has the bonding of the brake lining inside the drum, rather than on the shoes, which is common practice. This will prevent critical wear on the rim of the drum, and the shoes will drive with oily surfaces. The clutch shoe assembly is bolted to the free wheeling unit, which drives the main transmission gear pinion.

The main rotor shaft and main rotor spindle are made from titanium.

A pilot bearing guides the driven assembly to the center of the driving assembly. Axial freedom in the centrifugal clutch shoes provides for some flexing misalignment of the system. The pinion gear shaft extends to accept the spiral bevel gear to drive the tail rotor. The helical spur gears act as an oil pump, forcing oil into the tail rotor output gear cavity. There is a passage drilled from this cavity, back to the top of the main rotor lower thrust bearing, and the oil flows back to the main gear box through the thrust bearing. Because of the spur gear driving system, the main rotor turns opposite to the engine. The engine turning opposite to the main rotor system, relieves the tail rotor requirements to the ratio of the gear system divided by the arm from the center line to tail rotor center line.

The tail rotor drive shaft is supported by pillow block bearings on the tailboom. The tail rotor gear box is oil bath/splash lubrication for the spiral bevel gear set. The output shaft is made from titanium.

ENGINE

The **SAFARI** Helicopter is powered by one Lycoming O-320 four cylinder, horizontally-opposed, overhead-valve, air-cooled, carbureted engine with a dry sump oil system. It is equipped with a starter, 40 amp alternator, shielded ignition, two magnetos, muffler, oil cooler and induction air filter.

The engine is installed in a vertical position with an axial flow fan mounted directly on the prop boss. This fan forces air under pressure between all cylinders by using a pressure cowling and baffles around back sides of cylinders. Induction air enters through a filter box located on the right side of the aircraft. A hot air scoop also passes heated air to the air box. A selector valve, controlled by the pilot, allows either cool or warm air to flow through a flexible duct, and up into the carburetor.

The pilot should read and adhere to the procedures recommended in the Lycoming Operator's Manual to obtain maximum engine life and efficiency.

FLIGHT CONTROLS

Dual controls are standard equipment and all primary controls, exempt for the tail rotor control, are actuated through push-pull tubes and bellcranks. The bearings used throughout the control system are either grease bearings or have self-lubricated Teflon liners.

Cyclic Control

Cyclic pitch control of the main rotor blades is accomplished by a revolving plate, known as a swash plate. The swash plate may slide up or down on the rotor shaft, and may be tilted at any angle. Control rods run from the swash plate horns or the rotor blade control pitch horns, through a stabilizer, tied into the rotor blade control horns. The blade pitch is changed 90° ahead of the desired disc angle, because of the gyroscopic precession. The cyclic pitch is controlled by the cyclic stick, held in the right hand. The stick enables the helicopter to go forward, backwards and sideways.

Collective Control

The control horns controls both the twisting pitch change and the tilting of the head for directional heading. The twisting of the blades changes the pitch and the angle, at which the blades strike the air. This action is controlled by the collective, held in the left hand. Pulling up on the collective, the pitch increases, and the helicopter lifts. Lowering the collective, decreases the angle of attack, and the helicopter settles. Also on the collective control is the throttle, which is operated by twisting the collective like on a motorcycle throttle.

When the collective control is raised, the engine throttle is opened automatically by an interconnecting linkage, so the pilot need make only minor adjustments with the twist grip throttle control. At high power settings above 4,000 feet, the throttle correlation is less effective and manual throttle manipulation is required.

Tail Rotor Control

The tail rotor pitch is controlled by foot pedals, better known as anti-torque pedals, as this is what they actually do. They contract the torque of the main rotor system. When the right pedal is pushed, the pitch increases on the tail rotor, and as this overcomes the main rotor torque, the nose swings to the right. When the left pedal is pushed, the pitch decreases, and lets the torque of the main rotor system turn the helicopter to the left.

For the tail rotor control, stainless steel aircraft wires and sealed bearing pulleys are used.

ENGINE CONTROLS

A twist grip throttle control is located on each collective. They are interconnected and actuate the butterfly valve on the carburetor through a system of bellcranks and push-pull tubes. No cables or gears are used in the throttle control system. The linkage is designed so the throttle will open as the collective stick is raised.

Other engine controls include a mixture control and a carburetor heat control located on the center floor console.

CAUTION

If mixture control is leaned at high altitude, be sure it is pushed back in before descending to lower altitude, otherwise, engine may quit. If engine stops, lower collective, push mixture to full rich and restart using left hand.

A carburetor air temperature gage on the panel is used to determine the carb heat required during icing conditions. Apply heat as required to keep needle out of the yellow band when humid conditions exist.

CLUTCH

The clutch drum is bolted to the crankshaft prop flange. The main transmission input gear pinion shaft is installed with a pilot bearing into the clutch drum. Inside the clutch drive assembly, a certified sprag release clutch is mounted integrally, through which all power is transmitted into the main transmission.

The clutch is automatically engaging after the engine is started. It is even possible to start up the engine with the main rotor locked for added safety and released when the engine has come up to temperature.

FUEL SYSTEM

The fuel system is gravity-flow (no fuel pumps) and includes two (2) vented, each 14 gallon tanks, one on each side of the main transmission. The fuel shut-off valve is located in the cabin on the top left side of the left pilot seat.

Finger strainer and tank drain is installed at the bottom of each tank, and the fuel caps are vented. A fuel level sending unit, including a low fuel warning system, is installed at the top of each tank.

The fuel flows from the tank strainers to the shut-off valve, down through the gasolator strainer, and then onto the carb. The gasolator also has a fuel drain valve.

ELECTRICAL SYSTEM

The electrical system includes a 14 volt, 40 ampere alternator, voltage regulator with integrated over-voltage shut-down and low voltage indicator lamp. The system also includes A 12 volt, 25 ampere-hour battery and a battery contactor.

The battery and the voltage regulator is located under the passenger seat on the right side of the cabin.

Various switches/circuit breakers are located on the center console.

The breakers are marked to indicate their function and amperage. If a circuit breaker pops, wait a few moments for it to cool before resetting.

The Master Battery switch on the console controls the battery contactor which disconnects the battery from all circuits.

The over-voltage relay, which is included in the alternator voltage regulator, protects the electronic equipment from a momentary over-voltage condition or a regulator failure. If the ammeter indicates discharge during normal flight, turn off all nonessential electrical equipment and switch Alternator off and back on after one second to reset over-voltage relay. If ammeter still indicates discharge, terminate flight as soon as possible.

LIGHTING SYSTEM

A strobe anti-collision light is installed on the tailboom as standard equipment. The optional night lights include navigation light on each side of the cabin and on the tail. A landing light is installed aft under the cabin.

Post and internal lights illuminate the instruments.

The strobe, navigation and landing lights each have separate circuit breakers. The panel lights are on the same breaker as the navigation lights.

INSTRUMENT PANEL

The standard flight instruments include an airspeed indicator, dual engine and rotor tachometers, sensitive altimeter, manifold pressure gage and magnetic compass. The engine cluster gages include an ammeter, oil pressure, oil temperature, cylinder head temperature, transmission temperature and fuel quantity. Also provided are a carburetor air temperature and an outside temperature gage. A hour meter actuated by engine oil pressure is located on the panel.

Located on the center console are various switches and breakers. Space on the panel is also provided for optional flight instrument, clock, com-radio and transponder.

PITOT-STATIC SYSTEM

The pitot-static system supplies air pressure to operate the airspeed indicator and altimeter. The pitot tube is located on the front, bottom center of the bubble. The static source is located on left side of cabin.

An alternative static source is available by a selector valve on the center console.

TACHOMETERS

The **SAFARI** is equipped with a dual electronic engine and rotor tachometer. The engine and main transmission tachometers are driven by small electrical AC generators. The engine signal generator is mounted onto the accessory cover using the tach cable drive location. The main transmission signal generator is mounted at the top of the pinion shaft, near the tailrotor output driveshaft.

Both tachometers are self supplying, and do not need any external power source. This means that the tachometers will work even in a total power cut-out situation.

WARNING LIGHTS

Warning lights on the instrument panel include main and tail gear box chip lights, low voltage, and low oil pressure.

The main and tail gear box chip detectors are magnetic devices located in the drain plugs of each gear box. When metallic particles are drawn to the magnets, they close an electrical circuit, turning on the warning light.

The metal particles could be caused by a failing bearing or gear, thus giving the pilot warning of impending gear box failure. The low voltage light indicates a possible failure of alternator.

The low fuel and low oil pressure lights are actuated by sensors in those systems, and are independent of gage indicators.

HEATING AND VENTILATION

Fresh air vents are located in each door. The door vents are opened and closed by push/pull or rotating the vents.

The cabin heat uses pressurized air from the engine cooling shroud, via the oil cooler. It is then ducted from the cooler to the exhaust muffler, where the air passes through a heat exchanger inside the exhaust system.

From the heat exchanger, the air is ducted into the cabin, via an adjustable valve. The outlets are located at the front bottom of the bubble, to prevent defogging of the bubble.

The cabin heat valve directs the heat either into the cabin or out via an overboard discharge on the backside of the engine.

CAUTION

When not in use or in case of an engine fire, the heat control should be in the closed position to seal the cabin area from the engine compartment.

SEATS, BELTS AND BAGGAGE

Optional baggage space is located under each of the seats. With the seat cushions removed, the seat bottom can be hinged aft for access to the baggage space.

Each seat is equipped with a seat belt. Slide the fitting on the belt until it can be comfortably buckled as a seat belt, and then pull up on the shoulder straps to take out the excess slack in the seat belt.

The seats are not adjustable, but each helicopter can have different foam cushions placed behind the pilot, to position him forward. This allows most short pilots to reach the pedals, cyclic stick in its most forward position and the various knobs and switches on the console.

CAUTION

When using a cushion, always check for control freedom with the collective full up.

LANDING GEAR

The **SAFARI** uses a skid type landing gear. Most hard landings will be absorbed by the gear elasticity. However, in an extremely hard landing, the gear legs and tailboom braces can be bent. Carefully inspect the tailboom bottom braces and the first station after any hard landing.

The skids are made of aluminum, and can be equipped with hardened steel wear shoes, if frequent landing on concrete is expected.

OPTIONAL ENGINE PRIMER SYSTEM

When installed, the primer is located at the left side of the pilots seat, near the collective, for easy reach of the pilot.

Engine priming is performed as follows:

1. Unlock pump by rotating the handle clockwise until the locking pin disengage and the handle pops up.
2. Pump handle as required (normally three or four strokes) for priming.
3. Lock handle after priming by aligning the locking pin and slot, push down on handle and rotate approximately 180 deg.

SECTION 9

HANDLING, SERVICING AND MAINTENANCE

GENERAL

This section outlines the procedures recommended for handling, servicing and maintaining the **SAFARI** Helicopter. Every owner/builder should stay in touch with the CHR I to keep their helicopter current.

It is the owner/builders responsibility to be registered with the factory and inform the factory of any change in address. This information and contact will help to ensure the free flow of all pertinent information as it becomes available.

All aviation regulations place the responsibility for the maintenance of a helicopter on the owner and operator of the helicopter. He must ensure that all maintenance is performed and in accordance with all established airworthiness regulations and requirements.

All limits, procedures, safety practices, time limits, servicing and maintenance requirements contained in this handbook are considered to be mandatory.

REQUIRED DOCUMENTS

The following documents must be in the aircraft at all times:

1. Airworthiness Certificate
2. Registration
3. Radio Station License (if required)
4. Pilot's Operating Handbook (Flight Manual)
5. Weight and Balance
6. Pilot's Check List

The following documents should not be carried on the helicopter, but must be available for use by any mechanic or pilot servicing the helicopter.

1. Aircraft Logbook
2. Engine Logbook

REQUIRED INSPECTIONS

The FAA require that all registered civil aircraft undergo a complete (annual) inspection every year (twelve months). This annual inspection must be signed-off by the mechanic or the owner/builder. This inspection is required whether the helicopter has been used or not during the twelve month period.

In addition to the annual inspection, the **SAFARI** Maintenance Manual requires an inspection every 100 hours of operation.

CHR International Inc. may occasionally publish an Airworthiness Directive (AD's) that apply to the **SAFARI** Helicopter. They are mandatory changes or inspections which must be complied with within the time limit specified. When an AD is issued, it is sent to the latest registered owner of the aircraft affected and to subscribers of the service. The owner should periodically check with CHR I to be sure that the latest AD's issued have been complied with.

ALTERATIONS TO THE SAFARI

The small size, compactness and many unique features of the **SAFARI** Helicopter make any modification to the aircraft inadvisable. The dynamic characteristics and susceptibility to fatigue of the helicopter rotor, drive and control system make any modification to these systems extremely hazardous.

Also hazardous is the installation of any electronic equipment or avionics not approved and supplied by Canadian Home Rotors Inc.

Because of potential hazards, Canadian Home Rotors Inc. does not approve any modifications or alterations to the **SAFARI** Helicopter other than those which are supplied by the factory.

For leveling, hoisting, jacking or trailering of the helicopter, see appropriate sections of the Maintenance manual.

The helicopter is normally maneuvered on the ground using ground handling wheels.

Attaching wheels:

1. Hold handle and wheel with the protruding spindle in its lowest position.
2. Insert wheel spindle into support mounted on skid. Make sure spindle is all the way in.
3. Pull handle over center to raise helicopter and lock wheel in position.

CAUTION

When attaching and detaching ground handling wheels, the handle has a tendency to snap over.

Moving the helicopter on ground handling wheels:

- Move the helicopter by holding the tailrotor gearbox and aft section of tailboom.
- If additional help is needed to move the helicopter, a person may push at a welded cluster on the tailboom to prevent any bending of the tailboom tubing.

CAUTION

Do not move the helicopter by gripping the vertical fin, horizontal stabilizer, tailrotor or tailrotor controls.

PARKING AND TIE DOWN

1. Lock the cyclic control in neutral.
2. Put the collective full down and lock into place.
3. Align rotor blades fore and aft, and tie down the aft blade with an elastic strap to the tailboom.
4. Whenever storm condition prevail or wind velocities higher than 30 MPH are forecast, the helicopter should be hangared or evacuated to a safe area.

ENGINE OIL

The recommended maximum quantity of oil is eight (8) quarts and the minimum quantity for take-off is six (6) quarts. The oil should be changed after the first 25 hours and every 50 hours thereafter. Change oil at least every six (6) months even if less than 50 hours have been flown. The following grades are recommended:

Air temperatures at Ground Level	Use first 50 hours Mil-L-60828 Straight Mineral	Use after first 50 hours Mil-L-22851 Ashless Dispersant
Above 16°C (60°F)	SAE 50	SAE 40 or 50
-1°C (30°F) to 32°C (90°F)	SAE 40	SAE 40
-18°C (0°F) to 21°C (70°F)	SAE 30	SAE 30 or 40
Below -12°C (10°F)	SAE 20	SAE 30

The use of "Multigrade 20 W 50" oil is approved after first 50 hours.

FUEL

The approved fuel grades and fuel capacity is given in Section 3 – pg. 17, Limitations.

A small quantity of fuel should be drained from the gasolator and the tank drains, prior to the first flight each day. The fuel drained should be observed for water or dirt contamination and approved color. If fuel contamination is suspected, remove and drain sediment bulb from gasolator. Open drains on fuel tanks and flush out tank with clean fuel.

BATTERY SERVICE

For access to the 12 volt battery, remove right side seat cushion and hinge the seat aft. Remove the cover from the battery box. Check the battery for proper fluid level but DO NOT fill above baffle plates. Fill only with distilled water, not acid.

JUMP STARTING ENGINE

A dead battery should NOT be jump started. A discharged battery is NOT AIRWORTHY because it will not have the necessary reserve capacity to operate the electrical system should the generating system fail in-flight. Also, the fast recharge from the alternator will damage the battery and result in premature battery failure. However, if in an emergency the aircraft must be jump started, using one automotive jumper cable, connect the positive terminal of the auto battery to the input terminal of the helicopter starter relay. The relay is located under the passenger seat, and the input terminal is the one connected to the main contactor. Using the other cable, connect the negative terminal of the auto battery to the helicopter engine or grounding strap. Start the auto engine and allow it to run at a fast idle. Wait a few moments, then start the helicopter engine. Disconnect the jumper cables in the reverse order that they were connected.

CAUTION

Batteries give off a gas which is flammable and explosive. Keep open flames or electric sparks away from battery. Do not smoke near battery. Batteries also contain acid which can cause personal injury, particularly to eyes. Protect your eyes, face and other exposed areas when working near a battery.

MAIN ROTOR AND TAIL ROTOR GEAR BOX OIL

If there is no sign of oil in the sight glass of the main rotor or tail rotor gear box when the helicopter is level, oil must be added before flight.

To add oil, complete the following steps:

1. Remove the safety wire from the filler plug located on top of the gear box.
2. Use only 90 weight oil. (Hypoid type)
3. Fill very slowly until the oil level is half of sight glass when helicopter is level.
4. Reinstall filler plug.
5. Safety wire as before. Be sure safety wire applies tension in direction which would tighten plug.

CAUTION

Do not overfill gear boxes.

CLEANING HELICOPTER**CLEANING ENGINE**

Before cleaning the engine, place a strip of tape on the magneto vents to prevent any solvent from entering.

1. Place a large pan under the engine to catch waste.
2. Spray or brush the engine with solvent or a mixture of solvent and degreaser. In order to remove especially heavy dirt and grease deposits, it may be necessary to brush areas that were sprayed.

CAUTION

Do not spray solvent into alternator, starter, air intake or the "V"- belt.

3. Allow the solvent to remain on the engine from five to ten minutes. then rinse the engine clean with additional solvent, or with water, if waterborne degreaser is used. Allow engine to dry.

CAUTION

Do not operate the engine until excess solvent has evaporated or otherwise been removed.

4. Remove the protective tape from the magnetos.

CLEANING EXTERIOR SURFACES

The helicopter should be washed with mild soap and water. Harsh abrasives, alkaline soaps or detergents could make scratches on painted or plastic surfaces or could cause corrosion of metal. Cover areas where cleaning solution could cause damage. Use the following procedure:

1. Flush any dirt away with water.
2. Apply cleaning solution with a soft cloth, a sponge or a soft bristle brush.
3. To remove stubborn oil and grease, use a cloth dampened with naphtha.
4. Rinse all surfaces thoroughly.
5. Any automotive wax may be used to preserve painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing.

CLEANING THE CABIN BUBBLE

1. Remove dirt, mud and other loose particles from exterior surfaces with clean water.
2. Wash with mild soap and warm water or with an aircraft plastic cleaner. Use a soft cloth of sponge in a straight back and forth motion. Do not rub harshly.
3. Remove oil and grease with a cloth moistened with kerosene

CAUTION

Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone or window cleaning sprays.

4. After cleaning plastic surfaces, apply a thin coat of hard polishing wax. Rub lightly with a soft cloth. Do not use circular motion.
5. A severe scratch or mar in the plastic can be removed by rubbing out the scratch with jeweler's rouge. Smooth both sides and apply wax.