This handbook shall always be carried onboard during flight.

Date of Original Document: 29 November 2011
Revision Number: 2
Revision Date: 4 Feb 2013
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</tr>
</tbody>
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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. 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 1-3.

4. This manual should be changed to suit each owners SAFARI helicopter due to any changes the builder made. Engine size, make or options incorporated etc.
**CONTROL LIST:**

<table>
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<tr>
<th>Revision Range</th>
<th>Date</th>
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INTRODUCTION

This Pilot’s Operating Handbook is designed as an operating guide for the pilot. It includes the material helpful to the Constructor / 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.

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 nine 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.

THREE VIEW OF SAFARI 400 HELICOPTER
DESCRIPTIVE DATA:

MAIN ROTOR:
- Articulation: Free to teeter, Rigid in plane
- Number of Blades: 2
- Rotor Diameter: 26 ft. 4 in. (7,742 m)
- Blade Chord: 8 in. (203 mm)
- Blade Twist: 0 degrees
- Pre-cone Angle: 2 degrees
- Tip Speed @ 500 RPM: 663 fps. (202 m/s)

TAIL ROTOR:
- Articulation: Free to teeter, Rigid in plane
- Number of Blades: 2
- Rotor Diameter: 4 ft. (1.22 m)
- Blade Chord: 4 in. (102 mm)
- Blade Twist: 0 degrees
- Pre-cone Angle: 0 degrees
- Tip Speed @ 2750 RPM: 575 fps. (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 to Tail Rotor: Spiral Bevel Gears with 1:1 Ratio

POWERPLANT:
- Model: Lycoming O-360
- Type: Four-cylinder, horizontally-opposed, direct-drive, air-cooled, normally-aspirated, carburetor-equipped.
- Displacement: 361 cubic inches.

Revision Number: 2  2-2  Revision Date: 4 Feb 2013
Normal Rating: O-360-C2C 180 BHP@2750 RPM

**ENGINE COOLING:**
Direct drive Multi-bladed Fan

**FUEL:**
Approved Fuel Grades are stated in your engine manual.
Capacity: 28 U.S. gallons (106 liters)

**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.

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

**OIL SUMP CAPACITY:**
8 U.S. Quarts (7.6 liters)

SEE YOUR ENGINE 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.

**Altitude:**

- **MSL** Is the height in feet above sea level shown by the Altimeter (corrected for position and instrument error) when the barometric pressure is set top 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.

- **Nr – Rotor**
- **Ne - Engine**

**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

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  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 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

<table>
<thead>
<tr>
<th>Multiply</th>
<th>By</th>
<th>To Obtain</th>
</tr>
</thead>
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<td>inches (in)</td>
</tr>
<tr>
<td>kilograms (kg)</td>
<td>2.2046</td>
<td>pounds (lb)</td>
</tr>
<tr>
<td>kilometers (km)</td>
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<td>nautical miles (nm)</td>
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<tr>
<td>kilometers (km)</td>
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<td>statute miles (mi)</td>
</tr>
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<td>liters (l)</td>
<td>0.2642</td>
<td>gallons, U.S. (gal)</td>
</tr>
<tr>
<td>liters (l)</td>
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<td>quarts (qt)</td>
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<tr>
<td>meters (m)</td>
<td>3.2808</td>
<td>feet (ft)</td>
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</table>

#### ENGLISH TO METRIC

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<thead>
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<th>To Obtain</th>
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<td>inches (in)</td>
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<td>centimeters (cm)</td>
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<td>inches (in)</td>
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<td>millimeter (mm)</td>
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<tr>
<td>nautical miles (nm)</td>
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<td>kilometers (km)</td>
</tr>
<tr>
<td>statute miles (mi)</td>
<td>1.6093</td>
<td>kilometers (km)</td>
</tr>
<tr>
<td>gallons, U.S. (gal)</td>
<td>3.7850</td>
<td>liters (l)</td>
</tr>
<tr>
<td>quarts (qt)</td>
<td>0.9464</td>
<td>liters (l)</td>
</tr>
<tr>
<td>pounds (lb)</td>
<td>0.4536</td>
<td>kilograms (kg)</td>
</tr>
</tbody>
</table>
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** indicates cautionary operating range.
- **Green** indicates normal operating range.

AIRSPEED LIMITATIONS

**NEVER-EXCEED AIRSPEED (Vne)**

Up to 3000 feet density altitude: 100 MPH (86.9 kts)

**AIRSPEED INDICATOR MARKINGS**

Red line at 100 MPH (86.9 kts)

ROTOR SPEED LIMITS

**Power On**

- Maximum: 500 RPM
- Minimum: 470 RPM

**Power Off**

- Maximum: 510 RPM
- Minimum: 470 RPM

**ROTOR TACHOMETER MARKINGS**

- Green Arc: 470 - 500 RPM

Revision Number: 2

Revision Date: 4 Feb 2013
POWERPLANT LIMITATIONS

ENGINE

One Lycoming Model O-360

OPERATING LIMITATIONS

Engine Speed, Maximum 2750 RPM.
Cylinder Head Temperature 500°F (260°C)
Oil Temperature 245°F (118°C)

Oil Pressure:
- Minimum during idle 25 psi
- Minimum during flight 55 psi
- Maximum during start & warm-up 115 psi
- Maximum during flight 95 psi

Alternator Max Load 35 amps

POWERPLANT INSTRUMENT MARKINGS

OIL PRESSURE

Lower red line 25 psi
Green Arc 55 to 95 psi
Upper red line 95 psi

OIL TEMPERATURE

Green arc 140°F to 245°F
Red line 245°F

CYLINDER HEAD TEMPERATURE

Red line 500°F

ENGINE TACHOMETER

Red line 2750 RPM.

TRANSMISSION TEMPERATURE

Red line 220°F
CARBURETOR AIR TEMPERATURE GAUGE

Caution range: -15°F to 15°F

MANIFOLD PRESSURE

Red line 26 in. Hg
Yellow arc 23.2 to 25.9 in. Hg

WEIGHT LIMITS:

Maximum gross weight

1650 lbs. (748 kg)

Maximum Cabin Capacity

490 lbs. (222 kg)

Minimum solo pilot weight

130 lbs. (59 kg)

Ballast must be in the correct position before flight.
**CENTER-OF-GRAVITY (CG) LIMITS**

The builder doing the calculations for the airworthiness requirements will determine actual ballast weight. The general average is 14 pounds.

Single person operation requires the ballast to be placed in the front right skid bracket and secured with a locking pin. Two person operation requires that the ballast be located in the tailboom bracket from the left hand side (opposite the tailrotor blades) again secured with the locking pin before flight.

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
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.

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

<table>
<thead>
<tr>
<th>Operation Type</th>
<th>Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFR flight</td>
<td>Prohibited</td>
</tr>
<tr>
<td>VFR day</td>
<td>Approved</td>
</tr>
<tr>
<td>VFR night operation</td>
<td>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.</td>
</tr>
</tbody>
</table>
FUEL
Approved Fuel Grade 91/96 or 100/130 octane minimum grade aviation fuel for the Lycoming engine.

**NOTE:** Aviation grade 100LL fuels in which the lead content is limited to 2 c.c. per gallon are approved for continuous use in the Lycoming engine.

**Fuel Capacity**
- Dual tank total capacity: 28 U.S. Gallons (106 liters)
- Dual tank useable capacity: 26.6 U.S. Gallons (101 liters)

**PLACARDS:**
In clear view of the pilot:

<table>
<thead>
<tr>
<th>Minimum Solo Pilot Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 lbs. (59 kg)</td>
</tr>
</tbody>
</table>

Located near fuel tank filler cap:

| 28 U.S. Gal. |

Located near shut-off valve:

| FUEL ON – OFF |

Located near tank fuel gage:

| FUEL 91/96 OR 100/130 Min. Octane Grade Aviation Gasoline Cap: 14 U.S. Gal. each |

Located in clear view of both occupants:

| NO SMOKING |
Located in clear view of pilot:

THIS ROTORCRAFT
APPROVED FOR VFR
OPERATIONS ONLY

Located inside each baggage compartment:

<table>
<thead>
<tr>
<th>Do not exceed any of the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compartment capacity:</td>
</tr>
<tr>
<td>Max 50 lbs. (23 kg)</td>
</tr>
<tr>
<td>Each seat plus compartment:</td>
</tr>
<tr>
<td>Max 245 lbs. (222 kg)</td>
</tr>
<tr>
<td>Rotorcraft gross weight limit:</td>
</tr>
<tr>
<td>1650 lbs. (748 kg)</td>
</tr>
</tbody>
</table>

Located on carburetor air temperature gage:

CAUTION
Below 18 in. MP ignore gage and apply full carb heat
- SECTION 4-  EMERGENCY PROCEDURES

GENERAL

The information contained in Section 4 is a suggested outline.

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.
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.
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.
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 light weight prevents 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 ¾ 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 with 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 with 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).  
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 and 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.
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.

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 to prevent damage to engine and possible engine failure.

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

<table>
<thead>
<tr>
<th>Light Type</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW FUEL (if installed)</td>
<td>Comes on when there is approximately one gallon of fuel remaining. The engine may run out of fuel within five minutes at rated power.</td>
<td>Terminate flight as soon as practical if light stays on.</td>
</tr>
<tr>
<td>LOW VOLT (If Installed)</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

**CAUTION**

Do not use LOW FUEL caution light as a working indication of fuel quantity.
- SECTION 5 - NORMAL PROCEDURES

GENERAL

The information contained in Section 5, Normal Procedures, is a suggested outline.

AIRSPEEDS FOR SAFE OPERATION

Take-off & Climbs .......................... 60 MPH
Maximum Rate-of-Climb (Vy) ............ 53 MPH
Maximum Range .............................................. 85 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
Gasolator................................................................. 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

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**DAILY OR PREFLIGHT CHECKS (cont’d)**

**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
- Swash plate bearings .................................................................................................... No looseness
- Blades ................................................................................................................................ Clean and no damage/cracks
- Rotor Head ...................................................................................................................... No leaks, secure
- All bolts and fasteners ..................................................................................................... Tight

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

**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 leaks, moves freely
- 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 .......................................................................................................... No signs of separation
- Oil cooler ........................................................................................................................ No oil leaks
- Cooling shroud ............................................................................................................... No cracks
- Oil hoses ....................................................................................................................... No leaks or chafing
DAILY OR PREFLIGHT CHECKS (cont’d)

Fuel tank right side
Leakage.................................................................................None
Quantity.....................................................................................Check
Filler cap..................................................................................Tight
Drain..........................................................................................Check

Fuselage right side
Landing gear..............................................................................Check
Ground handling wheels.........................................................Removed as required
Position light............................................................................Check
Door hinge safety pin..............................................................Installed as required
Ballast weight........................................................................Correct position/Secured

Nose Section
Windshield condition & cleanliness........................................Check
Pitot tube..................................................................................Clear

Fuselage left side
Landing gear..............................................................................Check
Ground handling wheels.........................................................Removed as required
Position light............................................................................Check
Door hinge safety pin..............................................................Installed 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
Collective Friction...............................................................Check, then as required\(^1\)
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

\(^1\) If Installed
TAKE-OFF PROCEDURE

- Avionics On
- Unlock controls
- Bring rotor RPM up slowly. At approximately 400 RPM, pull some collective to arrest vibration.
- Continue to 500 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. 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 (470 - 500 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 4000 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 4000 feet)

• Same as below 4000 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 good inertia rotor system. Most of the energy 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.

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 may occur if the rotor RPM ever droops below 400 RPM.
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 Engine Operator’s Manual.

**CAUTION**
CAT gage is only effective above 18 inches MAP.
During descents or autorotation, in 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 to neutral position before final reduction of rotor RPM.
**SHUT-DOWN**

Collective Down........................................................................................................Lock On
Cyclic / Pedals Neutral.........................................................................................Lock On
Idle 1500 RPM ( 1 minute )..................................................................................CHT drop
Avionics......................................................................................................................Off
Idle 1000 RPM........................................................................................................Off
Mixture......................................................................................................................Adjust
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 generates the lowest possible noise irritation to the general public while operating his helicopter. The following are several quieting techniques that 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 2000 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 that 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 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.

Use maximum power-on RPM during take-off and during level flight below 500 feet AGL or above 5000 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.

DENSITY ALTITUDE CHART
HEIGHT-VELOCITY DIAGRAM CHART

- 7,000 ft. DENSITY ALTITUDE @ 1400 lbs.
- SEA LEVEL @ 1500 lbs.
- RECOMMENDED TAKE-OFF PROFILE
- AVOID OPERATION IN SHADED AREAS

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GENERAL

The helicopter must only be flown within safe weight and balance limits. 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 gasolator or by disconnecting the flexhose 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.
2. Mark helicopter equipment list to show exactly which equipment is installed.
3. Hoist aircraft using ¾ 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.
4. Have one man hold tail of helicopter, while it is being hoisted, to stabilize aircraft.
5. Check that the main rotor blades are oriented fore and aft.
6. Prepare 2 ea. angle pieces 1” x 1”, length 10”. Place a angle piece (inverted) under each skid,
approximately at STA 80.

7. 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.

8. Mark the position (Empty center of gravity) on each skid.

9. Raise aircraft and place >500 lbs. capacity weight scales under each skid. Locate center of scales at the previous marked position.

10. 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.

11. Record empty weight.

   R Scale ______ lb.

   L Scale ______ lb.

   Tare ______ lb.

   Empty Weight ______ lb.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Weight (lbs.)</th>
<th>C.G. Arm ** (in.)</th>
<th>Moment* (lb.-in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ship as weighed (from step 10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Add drained unusable fuel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helicopter Basic Empty Weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Includes unusable fuel &amp; full oil)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*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.

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.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Long CG</th>
<th>Lat CG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot &amp; Baggage under L seat</td>
<td>50</td>
<td>-8</td>
</tr>
<tr>
<td>Passenger &amp; Baggage under R seat</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>Fuel</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>Cargo Hook</td>
<td>69</td>
<td>0</td>
</tr>
<tr>
<td>Doors</td>
<td>42</td>
<td>0</td>
</tr>
</tbody>
</table>
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 steel tubing, welded and of a 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 console 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, composite, semi-rigid teetering design.

The two-bladed system has the freedom in what is called the teetering plane. This system allows the rotor freedom span-wise to rock over a central bearing, known as the teetering 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 rotor-head 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 teetering 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, have 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 dampening to the engine. The clutch shoes engage the inside of an 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-360 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 the 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 Engine Operator’s Manual to obtain maximum engine life and efficiency.

**FLIGHT CONTROLS**

Dual controls are standard equipment and all primary controls, except for the tail rotor control, are actuated through push-pull tubes and bell-cranes. The bearings used throughout the control system are either grease bearings or have self-lubricated Teflon liners.
Cyclic Control
The Cyclic pitch control for the main rotor blades is accomplished by a revolving plate, known as the 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. 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 control 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.

Collective Friction
The collective friction system consists of a matched set of friction blocks which when squeezed together, apply a pinching action to the collective pivot tube effectively limiting its ability to move. It is intended to reduce pilot workload by relieving stick pressure and should never be used to “lock” the collective stick in place.

CAUTION
Collective friction must never be adjusted or set to prevent movement of the collective stick. Sufficient freedom of movement to control the aircraft must be maintained to prevent damage to the aircraft, injury or death.

Increasing of collective friction is accomplished by turning the Friction knob counter-clockwise. Decreasing of collective friction is accomplished by turning the Friction knob clockwise.

When Co-pilot is the Pilot in Command, friction is to be set full off.

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

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2 If Installed
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, a sealed push pull cable is 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 bell-cranks 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 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.

A 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 (optional). The system also includes a 12 volt, 25 ampere-hour battery and a battery contactor.

The battery and the voltage regulator are 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 night lights include navigation lights 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, panel lights and landing lights each have separate circuit breakers.
INSTRUMENT PANEL

The standard flight instruments include an airspeed indicator, dual engine and rotor tachometer, 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. An 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 inside the instrument panel.

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.

Warning Lights

Warning lights on the instrument panel include main and tail gear box chip lights, low voltage\(^3\), 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\(^3\).

The low fuel\(^1\) 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

\(^3\) Optional
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 comfortable 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 & MAINTENANCE

GENERAL

This section outlines the procedures recommended for handling, servicing and maintaining the SAFARI Helicopter. Every owner/builder should stay in touch with CHR International Inc. 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 suggested guidelines.

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

An inspection of your homebuilt experimental helicopter has to be done prior to any flight testing and the 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 CHRI 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 400 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. Because of potential hazards, CHR International Inc. does not approve any modifications or alterations to the SAFARI Helicopter other than those which are supplied by the factory.

**GROUND HANDLING**

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:

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

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.

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

The SAFARI helicopter is equipped with a maintenance free battery. No servicing is required.
**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 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.
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.