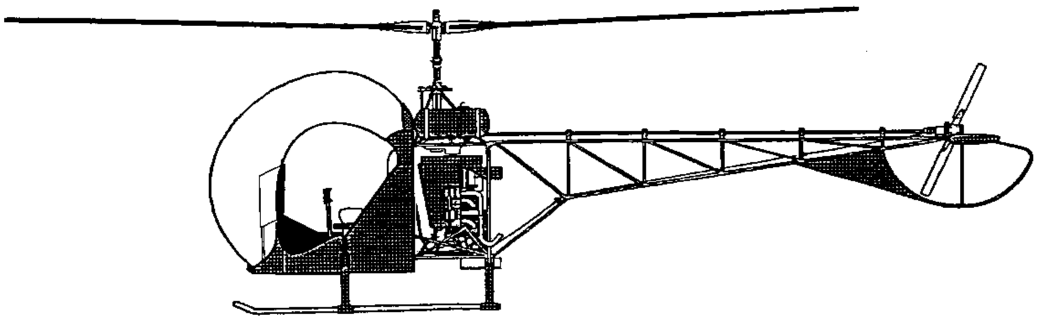
SAFARI 400 FLIGHT MANUAL

PILOT´S OPERATING HANDBOOK



SAMPLE-PROVIDED AS A FORMAT ONLY

NATIONALITY AND REGISTRATION MARKS	
DESIGNATION OF AIRCRAFT	
SERIAL NUMBER	
YEAR OF MANUFACTURE	
MANUFACTURER	

THIS HANDBOOK IS REQUIRED TO BE ONBOARD DURING FLIGHT

THIS EXAMPLE PROVIDED AS A CONVENIENCE TO SAFARI HELICOPTER BUILDERS. THE FAA CONSIDERS THE BUILDER OF A KIT AIRCRAFT TO BE THE MANUFACTURER. FOR THAT REASON, IT IS THE BUILDERS RESPONSIBILITY TO CREATE A PILOT'S OPERATING HANDBOOK THAT IS SPECIFIC TO THE AIRCRAFT. EACH PART OF THIS EXAMPLE SHOULD BE EDITED BY THE BUILDER TO PROVIDE ACCURATE INFORMATION TO FUTURE PILOTS OF THE HELICOPTER.

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- SECTION 1 - GENERAL

INTRODUCTION

This Pilot's Operating Handbook is designed as an operating guide for the pilot.

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. It should not be used for operational purposes unless kept in current status.

Assuring that the helicopter is in airworthy condition before operation is authorized is the responsibility of the owner. The pilot in command is responsible for determining that the helicopter is safe for flight. The pilot is also responsible for remaining within the operating limitations as outlined the flight manual

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.

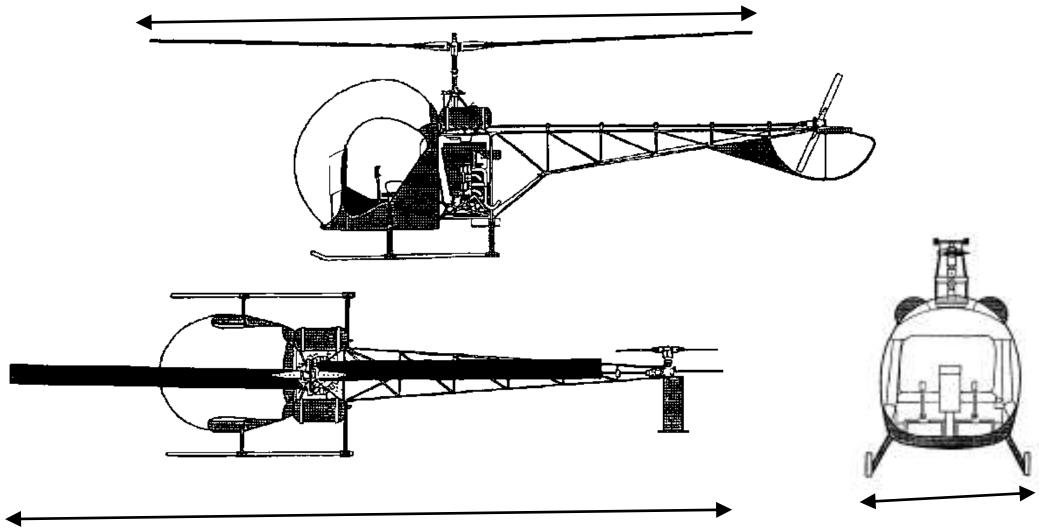
This handbook has been divided into numbered sections. The limitations and emergency procedures have been placed ahead of the normal procedures, performance and other sections to provide easier access to that information.

This Flight Manual applies only to the aircraft which Nationality and Registration Marks are noted on the title page.

It is the pilot´s responsibility to be familiar with the contents of this Flight Manual including revisions and any relevant supplements.

Modifications to the aircraft or changes in regulations by the Federal Aviation Administration that affect the operation of this aircraft should be incorporated into the flight manual by the builder or present owner of the aircraft. A record of the amendments to the flight manual should be maintained in the flight manual.

THREE VIEWS OF THE 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 bearing
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:

Type:

Displacement:

Normal Rating:

ENGINE COOLING:

Direct Drive Multi-Blade Fan

FUEL:

Approved fuel grades are stated in engine manual.

Capacity: 28 U.S. gallons (106 liters)

OIL:

SEE ENGINE MANUAL FOR INFORMATION

OIL SUMP CAPACITY:

8 U.S. Quarts (7.6 liters)

****SAMPLE – PROVIDED AS A FORMAT ONLY****

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

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 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

Multiply	By	To Obtain
centimeters (cm)	0.3900	inches (in)
kilograms (kg)	2.2046	pounds (lb)
kilometers (km)	0.5400	nautical miles (nm)
kilometers (km)	0.6214	statute miles (mi)
liters (l)	0.2642	gallons, U.S. (gal)
liters (l)	1.0567	quarts (qt)
meters (m)	3.2808	feet (ft)

ENGLISH TO METRIC

Multiply	By	To Obtain
feet (ft)	0.3048	meters (m)
inches (in)	2.5400	centimeters (cm)
inches (in)	25.4000	millimeter (mm)
nautical miles (nm)	1.8520	kilometers (km)
statute miles (mi)	1.6093	kilometers (km)
gallons, U.S. (gal)	3.7850	liters (l)
quarts (qt)	0.9464	liters (l)
pounds (lb)	0.4536	kilograms (kg)

- SECTION 2- LIMITATIONS

****SAMPLE – PROVIDED AS A FORMAT ONLY****

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. (86.9 kts)

AIRSPEED INDICATOR MARKINGS

Red line at 100 MPH (86.9 kts)

ROTOR SPEED LIMITS

Power On

Maximum	500 RPM (Governor set to 500 RPM)
Minimum	470 RPM

Power Off

Maximum	510 RPM
Minimum	470 RPM

ROTOR TACHOMETER MARKINGS

Green Arc	470 - 500 RPM

POWERPLANT LIMITATIONS

ENGINE

Manufacturer and description

OPERATING LIMITATIONS

Engine Speed, Maximum	2,750 RPM
Cylinder Head Temperature	
Oil Temperature	
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 40°F

CAUTION

BELOW 18 in MANIFOLD PRESSURE, IGNORE TEMPERATURE GAUGE AND APPLY FULL CARB HEAT

MANIFOLD PRESSURE

Maximum	29 in. Hg
Caution	26 to 28.9 in. Hg

WEIGHT LIMITS

Maximum Gross Weight	1,650 lbs. (748 kg)
Maximum Cabin Capacity	XXX lbs. (XXX kg) with 28 gal. fuel
Minimum Solo Pilot Weight	160 lbs. (73 kg)
Maximum Compartment Weight	XX lbs. (23 kg)
Maximum Seat Plus Compartment Weight	XXX lbs. (748 kg.)

BALLAST MUST BE IN THE CORRECT POSITION BEFORE FLIGHT

CENTER-OF-GRAVITY (CG) LIMITS

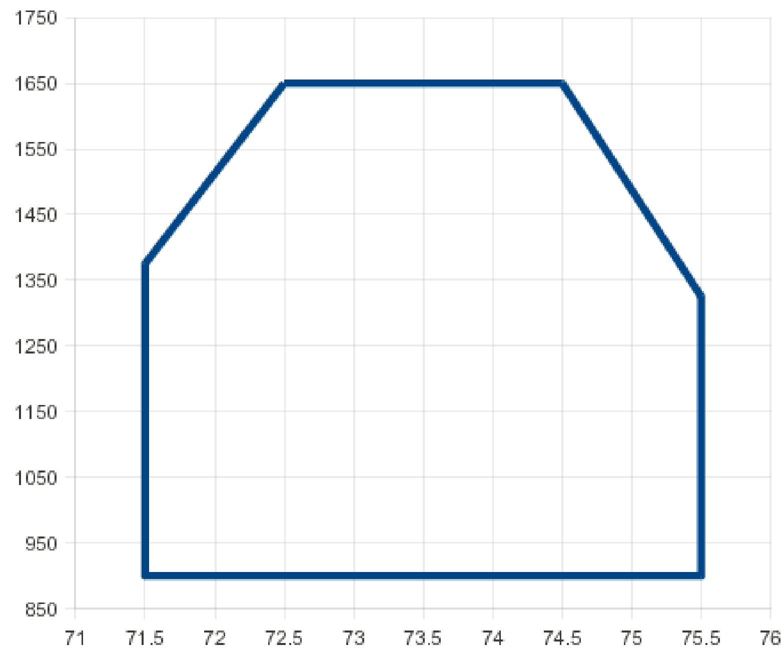
The builder doing the calculations for the airworthiness requirements will determine actual ballast weight. The general average is 14 pounds.

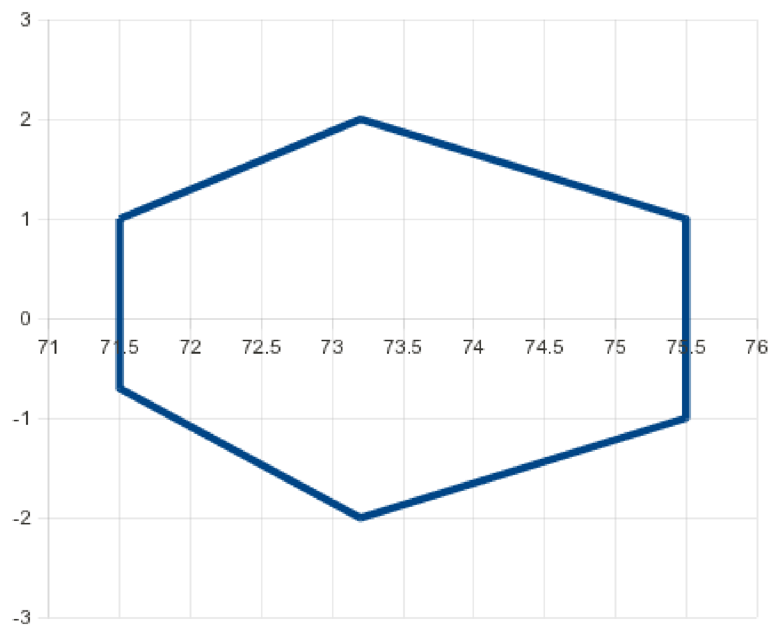
Single person operation requires the ballast to be placed in the bracket on the pedal framework on the co-pilot side and secured with a locking pin. Two-person operation requires that the ballast be located in the tail boom bracket from the left-hand side (opposite the tail rotor blades) again secured with the locking pin before flight.

Datum Line is XX inches (XXX cm) Forward of Aft Skid Leg (Station 91)

Forward CG limit	XXX inches (XXX cm) Aft of Datum
Aft CG limit	XXX inches (XXX cm) Aft of Datum
Left CG limit	XXX inches (XXX cm) Left of Ship Center
Right CG limit	XXX inches (XXX cm) Right of Ship Center

CENTER OF GRAVITY LIMITS CHART





FLIGHT AND MANEUVER LIMITATIONS

- Acrobatic flight is prohibited
- Flight during icing condition is prohibited
- Maximum operating density altitude is 10,000 feet
- Solo flight from left seat
- Right seat belt must be buckled
- Doors-off operation approved with either or both doors removed

CAUTION

Do not allow loose items 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

IFR flight	If properly equipped
VFR day	Approved
VFR night operation	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

SEE ENGINE MANUAL FOR INFORMATION REGARDING FUEL TYPES

Fuel Capacity

Dual Tank Total Capacity	28 U.S. Gallons (106 Liters)
Dual Tank Useable Capacity	26.6 U.S. Gallons (101 liters)

- SECTION 3- EMERGENCY PROCEDURES

SAMPLE – PROVIDED AS A FORMAT ONLY

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 light weight prevents attaining minimum 400 RPM
4. Select landing spot and, if altitude permits, maneuver so landing will be into wind
5. Turn off unnecessary switches and shut-off fuel
6. At about 40 feet AGL, begin cyclic flare to reduce forward speed
7. At about 8 feet AGL, apply forward cyclic to level ship and increase collective to stop descent. 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 minimum 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 descent. Touch down 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 touch down 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 – NOT RECOMMENDED DUE TO POSSIBLE DAMAGE IF CLUTCH IS PARTIALLY ENGAGED.

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 battery 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 and master battery switch
4. Extinguish fire with fire extinguisher, wool blanket or dirt
5. Inspect for damage

ELECTRICAL FIRE IN FLIGHT

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

TACHOMETER FAILURE

If Rotor or Engine tachometer goes to zero in flight, use the remaining tachometer 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

LOW FUEL (if installed)	Comes on when there is approximately 3 gallons of fuel remaining. The engine may run out of fuel within five minutes at rated power
GOVERNOR (If Installed)	Indicated if governor is on or off

CAUTION

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

- SECTION 4- NORMAL PROCEDURES

SAMPLE – PROVIDED AS A FORMAT ONLY

GENERAL

AIRSPEEDS FOR SAFE OPERATION

Take-off & Climbs	60 MPH
Maximum Rate-of-Climb (Vy)	53 MPH
Cruise Speed	85 MPH
Landing Approach	65 MPH
Autorotation	60 MPH

THE FOLLOWING EXAMPLE IS A MINIMUM OF ITEMS AND AREAS THAT SHOULD BE INSPECTED BEFORE FLIGHT. IT IS THE BUILDER'S RESPONSIBILITY TO CREATE AN ACCURATE AND COMPLETE AIRCRAFT SPECIFIC DOCUMENT. A COPY SHOULD BE CARRIED ABOARD THE HELICOPTER AND REFERRED TO PRIOR TO EACH FLIGHT.

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 (check vent hole)

Drain.. Check

Main Rotor

Lead/lag hinges..Check
Gear box oil level.. Middle of sight glass

Orange flex 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 leaks, secure

All bolts and fasteners... Tight

Swashplate drivers...No looseness or cracks

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...............................………...........................………...... Middle of sight glass

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

Fuel tank right side

Leakage...……………........... .... None

Quantity...…………………........ Check

Filler cap...…...........……………… .... Tight (check vent hole)

Drain..……………............. Check

Fuselage right side

Landing gear...………........…………..... Check

Ground handling wheels.....................................……………… .... Removed as required

Position light...……...………… ..... Check

Door hinge safety pins... 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 frame 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.........................………….. Check free with full travel

Cyclic / Collective.......................................…………............................ Locked back in place

All switches / Avionics......………......…….. Off

Fuel shut-off valve...................………….…................................. .... Open

Mixture……………………………………………………………….Full rich (if carbureted)
Master switch...................................………….............................. .... On

Strobe lights………………………………………………………………On
Magneto switch..........................…………...As Required by Engine
Carburetor heat..............................……………..Off

Throttle.......................................…………... Cracked

STARTING ENGINE

Primer............……………... .... If installed

Area.............................………….. Clear

Starter switch...............................………….. Engage/Release

Magneto switch.......................................………….............................. Both

Alternator......………..….. .... On

Instrument switch……………………………………………………………On
Battery charge...............................…………............ .... Check amp meter

Oil pressure after cranking..............................…………......................... 25 psi

Maximum idle RPM....…………….. 700-1,000 RPM

Clutch............……………...Engine idle until clutch fully engaged
Warm-up RPM........……………..1,500 – 1,700 RPM

ENGINE CHECK

Pressure / Temp.....................................……………............. .... .Green area of gauge

Magneto drop check...……………....1,700 RPM

Sprag clutch check..............……………............................... .... .Needle split

Carburetor heat……………………………………………………………Watch MAP rise
Pilot Assist switch…………………………………………………………On at 1,700 with engine at steady RPM. Light will blink intermittently, then remain lit.

TAKE-OFF PROCEDURE

- Avionics on and set
- Unlock collective and cyclic and test again for free full movement
- Check pedals for free full movement
- Bring rotor RPM up slowly, pulling collective simultaneously.
- At approximately 400 RPM, engage the governor with the on/off button mounted on the collective switch box. Verify that the engine governor increases the rotor RPM to 500 and maintains that RPM.
- If the engine governor is turned off or not functional, 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 4,000 feet)

- Lower collective and decrease throttle to prevent rotor overspeed.
- Adjust 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 4000 feet except throttle must be reduced slightly before lowering collective and increased slightly when collective is raised.

PRACTICE AUTOROTATION - WITH GROUND CONTACT

- If practicing autorotation's 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 SAFE INERTIA ROTOR SYSTEM, WITH CONSIDERABLE MASS IN THE 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 500 RPM. CATASTROPHIC ROTOR STALL MAY OCCUR IF THE ROTOR RPM DROPS BELOW 420 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 carburetor heat as follows:

  1. During hover or cruise flight above 18 inches MAP, apply carburetor heat as required to keep the CAT gauge out of the yellow arc. If an unexplained drop in manifold pressure or RPM occurs, apply full carburetor heat for about one minute and check for an increase in MAP or RPM.
  2. During autorotation or reduced power below 18 inches MAP apply full Carb heat regardless of CAT gauge 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 GAUGE IS ONLY EFFECTIVE ABOVE 18 INCHES MAP.

DURING DESCENTS OR AUTOROTATION, IN CONDITIONS CONDUCIVE TO CARBURETOR ICING, IGNORE GAUGE AND APPLY FULL CARBURETOR 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 1700 RPM (1 minute) .... CHT drop-2 min. 350° hottest cylinder

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

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, ball games 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 5- PERFORMANCE

SAMPLE – PROVIDED AS A FORMAT ONLY

GENERAL

Hover controllability has been substantiated in 17 kt. winds from any direction.

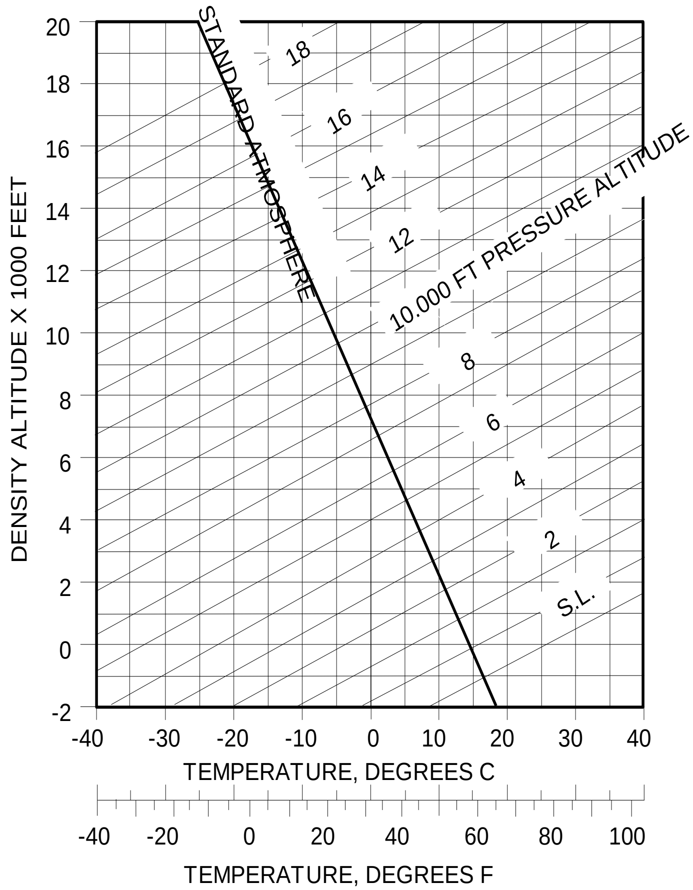
Use maximum power-on RPM during take-off and during level flight below 500 feet AGL or above 5000 feet density altitude.

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

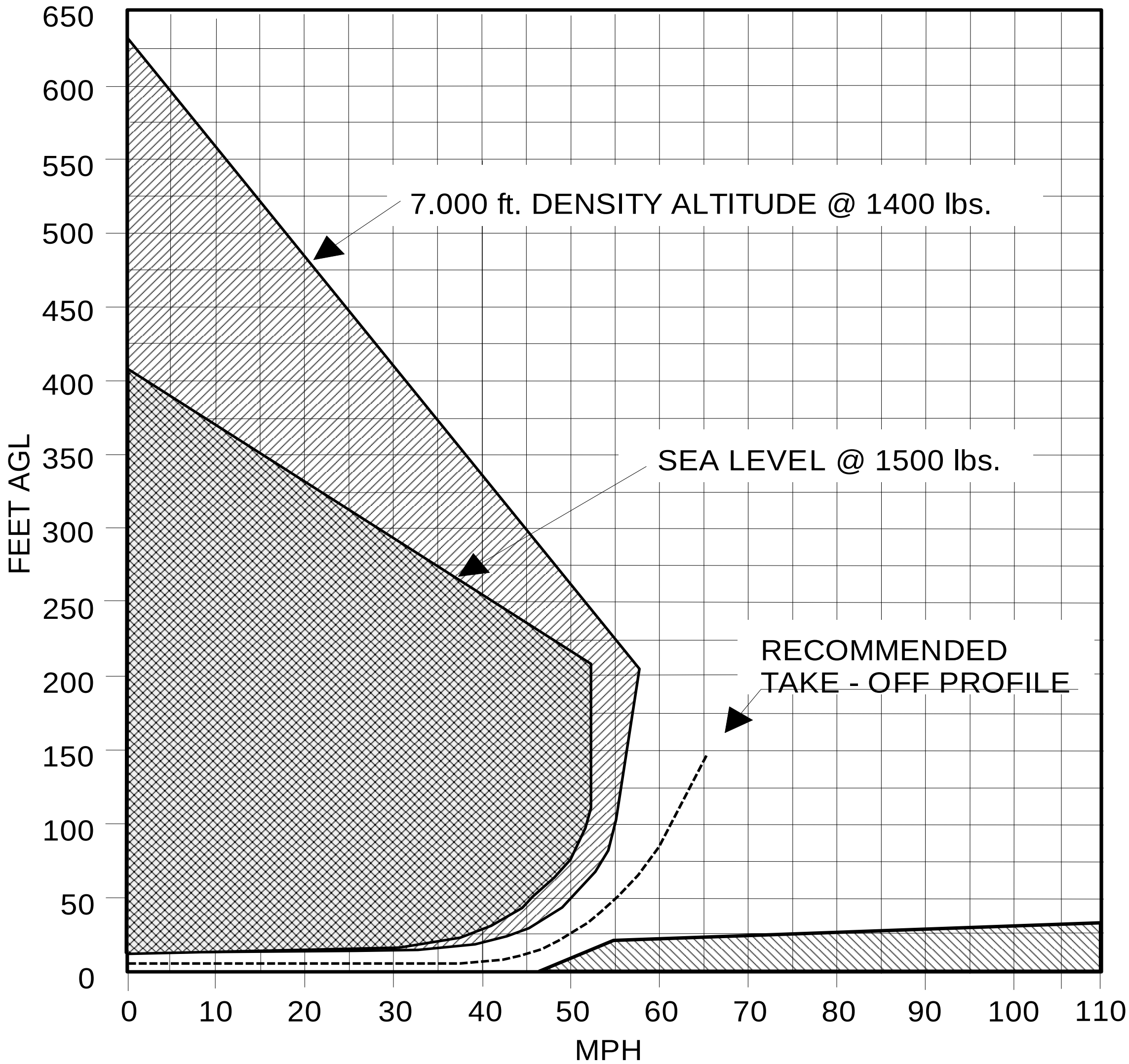
CAUTION

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



AVOID OPERATION IN SHADED AREAS

- SECTION 6- SYSTEMS DESCRIPTION

SAMPLE – PROVIDED AS A FORMAT ONLY

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 tail boom 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 with Symmetrical Composite Blades

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 with Symmetrical Titanium Blades

The tail rotor blades, unlike the main rotor blades, have a titanium tube spar in the center of the blade, and are otherwise hollow titanium sheet. 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 freewheeling 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 or equivalent 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.

OTHER ENGINES AND OPTIONS ARE AVAILABLE, SO THE BUILDER SHOULD MODIFY THIS SECTION TO REFLECT THE EQUIPMENT INSTALLED ON THIS HELICOPTER.

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.

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.

A carburetor air temperature gauge 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.

CAUTION

IF MIXTURE CONTROL IS LEANED AT HIGH ALTITUDE, BE SURE IT IS PUSHED BACK IN BEFORE DESCENDING TO LOWER ALTITUDE, OTHERWISE, ENGINE MAY STOP. IF ENGINE STOPS, IMMEDIATELY INITIATE AUTOROTATION TO A SAFE LANDING.

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.

OPTIONAL ENGINE PRIMER SYSTEM

When installed, the primer is located at the left side of the pilot's 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.

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 tail boom 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.

Ring and internal lights illuminate the instruments.

The strobe, navigation, panel lights and landing lights each have separate circuit breakers.

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 tail rotor output driveshaft.

Warning Lights

Warning lights on the instrument panel include main and tail gear box chip lights, engine governor failure, 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 engine governor failure light alerts the pilot to begin manual control of the throttle.

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

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-cranks. 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. Dual controls are included, but the passenger side cyclic pitch control can be removed using a kit available from the factory.

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 should 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, the engine RPM decreases slightly, and as this overcomes the main rotor torque, the nose swings to the right. When the left pedal is pushed, the pitch decreases, the engine RPM increases slightly, 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.

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 mounted to 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.

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 tail boom braces can be bent. Carefully inspect the tail boom bottom braces and the first station after any hard landing. The tail boom is pressure tested before being powder coated, and can be checked for cracks with an air hose.

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

GROUND HANDLING

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 MAY SNAP OVER

Moving the helicopter on ground handling wheels:

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

CAUTION

DO NOT MOVE THE HELICOPTER BY GRIPPING THE VERTICAL FIN, HORIZONTAL STABILIZER, TAIL ROTOR OR TAIL ROTOR 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 tail boom.
4. Whenever storm conditions prevail or wind velocities higher than 30 MPH are forecast, the helicopter should be hangered or evacuated to a safe area.

- SECTION 7- HANDLING, SERVICING & MAINTENANCE

SAMPLE – PROVIDED AS A FORMAT ONLY

GENERAL

This section outlines the procedures recommended for handling, servicing and maintaining the SAFARI Helicopter. Every owner/builder should be sure to provide the factory with current contact information.

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 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. The FAA requires that all registered civil aircraft undergo a complete (annual) inspection every year (twelve months). This annual inspection must be signed-off by an Airframe & Powerplant certificated mechanic or the aircraft builder if the Repairman Certificate was secured at the completion of the build. This inspection is required whether the helicopter has been used or not during the twelve month period.

Safari Helicopter may occasionally publish a Mandatory Inspection that applies to the SAFARI Helicopter. They are required changes or inspections, which must be complied with within the time limit specified. When an Mandatory Inspection is issued, it is sent to the latest registered owner of the aircraft affected and to subscribers of the service. Mandatory Inspections along with other Safety and Maintenance Notices are also available on the Safari Helicopter website: www.SafariHelicopter.com. The owner should periodically check with Safari Helicopter to be sure that the latest Mandatory Inspections 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, Safari Helicopter does not approve any modifications or alterations to the helicopter other than those which are supplied by the factory.

ENGINE OIL

The recommended maximum quantity of oil is eight (8) quarts and the minimum quantity for take-off is six (6) quarts.

SEE ENGINE MANUAL FOR INFORMATION

FUEL

The approved fuel grades are determined by the manufacturer of the engine installed in the helicopter. Fuel capacity is given in Section 1.

Prior to the first flight each day, a small quantity of fuel should be drained from the gasolator and the tank drains . 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

Required battery maintenance will be determined by the type of battery installed. Consult the manufacturer's manual.

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 contact. 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.
4. Remove the protective tape from the magnetos.

CAUTION

DO NOT OPERATE THE ENGINE UNTIL EXCESS SOLVENT HAS EVAPORATED OR OTHERWISE BEEN REMOVED.

CLEANING EXTERIOR SURFACES

Use cleaning products and methods appropriate to the finish on your painted surfaces. The frame is powder coated, and should be cleaned with any product recommended for painted surfaces.

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.