

THE MOSQUITO XE

HELICOPTER

OPERATORS MANUAL

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1. INTRODUCTION

Congratulations on your purchase of the Mosquito XE helicopter, one of the lightest manned helicopters in the world. With the proper care and attention to safety it will provide you with many hours of enjoyable flight.

This handbook is intended as a general guide for operation and maintenance of the helicopter. It is not intended to replace training by a certified flight instructor in any way, nor is it intended to replace the knowledge and skills of a properly trained aircraft mechanic.

Although it is light and small, the Mosquito is a real helicopter in every sense, with controls, drive and rotor systems and capabilities all similar to its bigger companions. It therefore requires the same amount of respect and consideration for safety and integrity that would be required of a larger helicopter. In order to fly the Mosquito, potential pilots must receive proper training. It is strongly recommended that pilots be fully trained to private pilot status in a small training helicopter such as a Robinson R22. Training to student pilots status is considered the minimum acceptable amount of training required.

Once the kit is completed, or during construction, the finished Mosquito should be inspected by a certified aircraft mechanic to ensure proper construction techniques and procedures have been followed and that the aircraft is airworthy.

NOTICE

The owner must be aware at all times that the responsibility for airworthiness of the helicopter, pilot competency and flight safety rest solely with the owner/operator. Operation of the helicopter by an inadequately trained pilot could result in severe injury or death! Operation of the helicopter when it is not fully air worthy could result in injury or death!

The owner/operator assumes all risk and responsibility for the operation of the Mosquito helicopter. The seller neither accepts or assumes any liability through the publication of this handbook. Information within this handbook is subject to change without notice.

2. SPECIFICATIONS

A. Airframe

Length (airframe):	17 ft
Length (overall):	21 ft
Height:	83 in
Width:	62 in
Materials:	Fiberglass Composite

B. Rotors

Main:

Articulation:	Semirigid underslung teeter
Diameter:	19.5 ft
Speed:	540 rpm
Chord:	7.0 inch
Twist:	None
Precone:	1.9 deg

Tail:

Articulation:	Semirigid 45 deg offset teeter
Diameter:	40 in
Speed:	2450 rpm
Chord:	4 in
Twist:	None
Precone:	1.0 deg

C. Drive:

Primary Reduction:	2.45:1 Cog belt
Secondary Reduction:	4.52:1 Cog belt
Gear Boxes:	1:1 Spiral Bevel Miter

D. Power Plant:

Model: Zanzottera MZ202
Type: Two Cylinder, Two Cycle, Dual Ignition, Twin Carburator
Power: 60 HP @6000 rpm

E. Fuel

Capacity: 12.5 US gallons
Type: Unleaded premium 92 octane
Consumption: 4.5 gallon/hr cruise
Oil:
Type: 100% Synthetic 2 Stroke
Premix Ratio: 40:1

3. OPERATIONAL LIMITS

A. Speed

Never Exceed (Vne):	90 mph
Maximum:	80 mph
Cruise:	65 mph
Minimum:	-20 mph

B. Rotor Speed

Never Exceed (Red):	110% (590 rpm)
High Caution (Yellow):	104% (560 rpm) - 110% (590 rpm)
Normal Operation (Green):	96% (520 rpm) - 104% (560 rpm)
Low Caution (Yellow):	90% (490 rpm) - 96% (520 rpm)
Never Below: (Red)	90% (490 rpm)

C. Engine:

Speed:

Maximum (Red):	108% (6500 rpm)
High Caution (Yellow):	104% (6250 rpm) - 108% (6500 rpm)
Operating (Green):	96% (5800 rpm) - 104% (6250)

Cylinder Head Temperatures:

Maximum:	500 F
Caution:	400 F - 500 F
Operating:	300 F

Exhaust Gas Temperature:

Maximum:	1400 F
Caution:	1350 F – 1400 F

D. Weight:

Maximum Take Off Weight:	610 lb
Maximum Pilot Weight:	240 lb
Empty Weight:	298 lb

E. Altitude

Maximum Hover in Ground Effect:	8000 ft density altitude
Maximum Hover out of Ground Effect:	6500 ft density altitude
Maximum Operational Altitude:	8000 ft density altitude

F. Flight Maneuvers

Acrobatic flight prohibited

Flight during icing conditions prohibited

Forward pushovers (sudden applications of full forward cyclic) are prohibited. The resulting low or negative rotor loading coupled with large control movements can result in loss of rotor control.

4. STANDARD OPERATING PROCEDURES

A. General

Information provided in the procedures section is based on standard helicopter operating procedures and experience gained through flight testing of the Mosquito. The seller makes no claims to the accuracy of suitability of the following procedures, nor has any regulating body approved of them. They are provided for informational and educational purposes only.

B. Flight Speeds

Maximum Rate of Climb:	35 mph
Maximum Range:	55 mph
Power On Landing Approach:	45 mph
Power Off Landing Approach:	35 mph

C. Flight Operation

Prior to Startup:

Perform complete preflight checks (see “6.0 Inspections”)

Fuel valves - ON

Fasten seat belt

Check full travel of all controls for smooth operation

Collective full down, cyclic neutral, foot pedals neutral

Choke – ON

Check area all clear

Engine Startup:

Master Switch – ON

Throttle slightly open

Engage starter button

Allow engine to idle at 1600 – 2000 rpm until cylinder head temp gauges start to show temperature rise

Flip master switch to single ignition operation. Digital tach should stop reading rpm and return to hour reading. Listen for slight drop in rpm. Return master to dual ignition setting.

CAUTION! Do not permit centrifugal clutch to remain partially engaged during startup or idle. Rotors should not turn during engine idle. Clutch must either be disengaged or fully engaged with engagement period being no longer than 3 seconds.

Rotor Run up:

Slowly increase throttle to 100% rpm. Monitor gauges for increase in CHT and EGT. Rotor/Engine Tach should both read 100%. Digital tach should read 6000-6100 rpm.

Cut throttle to idle. Monitor Rotor/Engine tach for split in rotor vs. engine rpm to verify correct operation of sprague clutch.

Take Off:

Liftoff should always be done while facing into the wind.

Slowly increase throttle to 100% rpm.

Raise collective to hover position. Maintain rotor rpm within upper green range. Manual throttle setting should not require significant adjustment during lift into hover. If excessive adjustment is required, readjust location of throttle cables in correlator slots as required.

Maintain hover at 2 to 3 feet AGL.

CAUTION: Do not hover below this level unless helicopter is equipped with a training boom. Wind gusts when hovering within inches of the ground can cause a skid can catch during the resulting lateral movement resulting in tip over.

Monitor gauges for operation in within normal operating zone.

Move cyclic forward and accelerate up to climb speed while maintaining heading into the wind. Maintain speed/altitude within safe zone of Height Velocity curve at all times (refer to H-V diagram).

Maintain rotor rpm in 100% to 104% rpm green range at all times.

Cruise:

Maintain rpm in 100% to 104% range

Avoid excessive control excursions. Fly smoothly.

Monitor engine temperature gauges at all times.

Approach and Landing:

Approach to landing should always be done into the wind.

Maintain forward speed above 20 mph at all times during decent.

CAUTION! Never descend at low or zero forward airspeed to avoid “settling with power” or “vortex ring state” flight mode.

Gently flare and come to a hover at 5 to 10 feet AGL.

Gradually reduce collective until ground contact. Maintain rpm in 100% to 104% range at all times.

Continue to reduce collective until fully settled.

Shut Down:

Reduce throttle until engine is at idle.

Idle engine for approximately 1 minute to facilitate cooling.

Throttle - FULL OFF

Master switch - OFF

5. EMERGENCY OPERATING PROCEDURES

A. General

Information provided in the procedures section is based on standard helicopter operating procedures and experience gained through flight testing of the Mosquito. The seller makes no claims to the accuracy of suitability of the following procedures, nor has any regulating body approved of them. They are provided for informational and educational purposes only.

B. Emergency Conditions

Emergency flight procedures should be followed whenever a power or drive system failure is indicated during flight. These conditions will be indicated by the following:

- Sudden change in noise level
- Sudden onset of abnormal noise
- Sudden yaw to the left (engine failure)
- Sudden yaw to the right (tail rotor failure)
- Engine/Rotor tachometer in low yellow or red zone
- Sudden change in vibration level or frequency

C. Power Failure During Climb, Cruise or Descent

- Lower collective lever immediately
- Apply full right pedal
- Maintain rotor rpm in green zone, adjust collective accordingly
- Adjust pedal to maintain forward heading
- Establish decent glide at 35 to 40 mph
- Select landing spot so that landing approach will be into the wind
- At 30 feet begin flare to slow forward speed until reduced to a minimum at 5 to 10 feet AGL.
- At 5 to 10 feet apply forward cyclic to level attitude.
- Pull collective to cushion landing. Maintain heading into the wind.
- Avoid touchdown with lateral movement.

D. Power Failure During Hover

Apply full right pedal

Allow aircraft to settle

Increase collective at 3 to 5 feet to cushion landing

E. Tail Rotor Failure During Climb, Cruise or Descent

Lower collective lever immediately to enter autorotation

Establish decent glide at 35 to 40 mph

A small amount of power may be used during the decent if needed to extend glide.

At 30 feet close throttle and perform emergency autorotation landing as outlined in section C above.

F. Tail Rotor Failure During Hover

Close throttle immediately

Allow aircraft to settle

Increase collective at 3 to 5 feet to cushion landing

G. Gauge Failure During Flight

Rotor Tachometer

Maintain engine tachometer in green zone and perform normal power on landing as soon as possible. Maintain collective in normal decent position to prevent rotor from entering autorotation.

Engine Tachometer

Maintain rotor tachometer in green zone. Use backup digital tachometer as required. Land as soon as possible.

EGT/CHT gauge

Maintain normal operation and land as soon as possible.

CAUTION! Never fly with defective gauges.

6. INSPECTIONS

A. General

To make flight as safe as possible it is essential to conduct a thorough pre-flight and post-flight inspection before and after every flight. Pre-flight inspections provide invaluable insight to impending failure through signs such as loose bolts, rivets, fittings, wire connections, belts or bearings; cracking in structural, engine or other components; chafing or rubbing in areas not intended to contact. Post flight inspections are used to feel for excess heat coming from bearings or gear boxes which can indicate impending failure.

Preflight inspection should be conducted in an orderly consistent fashion to ensure all points are inspected each time. The following list is provided as a minimum requirement for flight inspections and is not intended to be a complete comprehensive preflight or post flight schedule. The seller assumes no responsibility for the completeness or suitability of the following list and is provided as a guideline for educational purposes only. Remember that the responsibility for the safety of each flight rests solely with the owner/operator of the aircraft.

B. Preflight Inspection

Start at the front left of the aircraft and finish at the front right, progressively circling the aircraft.

Left Side:

Skid/bows – secure, rivets secure, bracket integrity (free of nicks, cracks)

Foot pedal bell crank – pivot bearing play, pivot bearing retention bolts tight, pivot bolt tight, support rivets secure, support integrity, pitch links rod end play (no axial movement), rod end bolts secure

Foot pedals – full and smooth pedal travel, full tail rotor movement, rod end play, bolts tight, cable bolt tight, rivets secure, pedal integrity

Foot pedal support – rivets secure, support solid, support integrity

Instrument panel – instruments secure, wire sockets fully engaged, pitot/static tubing in place, rivets secure, bracket integrity, panel integrity

Body integrity – cracks in cabin, keel, seat support stringers, torque tube, firewall, landing gear fasteners.

Windshield – cracks, crazing, loose rivets, cleanliness.

Seat – supports/fasteners secure, seat integrity.

Cyclic lever – full and smooth travel in all directions, pivot bearing play, pivot bolt tight, rod ends secure, support rivets, support integrity, push pull tube rivets secure

Collective lever - full and smooth travel, support/slave lever/torque tube/correlator/lever integrity, all rivets secure, rod end play, full travel of throttle, cable sleeve secure, cable integrity (no fraying)

Control Mixer – (lift collective lever and view under seat) , collective slave lever integrity , rod end play, rod end bolts tight, component integrity

Swash plate – bolts tight (marks on bolts in correct position), rod end play, bearing play (move stationary plate bolt in slot back and forth), component integrity (lift collective full up to check push rods and rod ends), push rods secure

Engine mounts – mount and mount bracket integrity, rubber bushing seating and condition, mount plate integrity, mount bolts tight

Engine - carburetors secure, carburetor mount condition, throttle cable secure, CDI mount condition, all wiring (regulator, instrument senders, plug etc) secure and in good condition, oil seepage, fan integrity, fan shroud secure, exhaust and exhaust mount integrity

Primary reduction – centrifugal clutch secure, sprocket/belt condition, belt tension, sprague clutch (spin and engage reduction), bearing play (move sprocket edge up and down), bolts tight, component integrity

Drive shafts – bolts tight, shaft and flex plate integrity, coupling integrity, set screws tight

Tail boom – flange integrity, bolts secure, control cable chaffing, delamination

Splitter gear box – bolts tight, oil leaks, oil filler plug secure, bearing play (move coupling on shaft back and forth)

Secondary reduction – sprocket/belt condition, belt tension, bolts tight, bearing play (move upper coupling back and forth, move rotor shaft back and forth)

Rotor head – hub plate/blade grip/blade root integrity, bolts tight, rod end play, push tube play (move push tube back and forth), butterfly lever bearing play, controls components integrity (lift collective full up to inspect push tube/push rods)

Main rotor blades – integrity (scratches, cracking, disbonding, tip cap security, cleanliness)

Tail rotor gear box –bolts tight, oil leaks, oil filler plug secure, bearing play (move shaft back and forth)

Tail rotor controls – bolts tight, rod end play, shaft clean and greased under control bearing sleeve, component integrity, rivets secure, control cable integrity

Tail rotor blades – pivot nut cotter pin, integrity (scratches, cracking, tip foam, cleanliness)

Right Side:

Tail rotor guard – integrity, bolts tight

Tail boom – flange integrity, bolts secure, delamination

Engine – mount bolts tight, starter secure, battery secure, wiring secure, EGT senders secure, exhaust and exhaust mount integrity, oil seepage

Engine mounts – same as left

Drive shafts – same as left

Rotor head – right side component integrity

Seat – same as left

Cyclic lever – component integrity

Skids/bows – same as left

C. Postflight Inspection

Immediately following shut down, after all rotating components have stopped moving the following checks should be made. Note that some heat from bearings is normal and is expected. Get to know the expected warmth from the bearings through habitually performing post flight checks. The onset of noticeable excess heat will warn of impending bearing failure.

Main rotor bearings – place hand at top of mast under rotor shaft sprocket

Main rotor hub teeter bearings– feel hub plates at teeter bearing

Main rotor feather bearings – feel inner and outer pivot blocks

Secondary reduction driving sprocket bearings – feel upper and lower bearing housings

Splitter gear box

Tail boom steady bearings – feel along top of tail boom for each support bearing

Tail rotor gear box

Tail rotor hub

Tail rotor feather bearings

D. Periodic Maintenance

The following components require periodic attention to ensure proper lubrication. Grease lubrication points SLOWLY to prevent pushing out grease seals. Watch for a small amount of grease to emerge on opposite end of bearing. Remove excess grease and clean area. All points should be greased every 10 hours of flight operation.

Main rotor teeter bearings

Main rotor feather bearing

Tail rotor feather bearings

Tail rotor and splitter gear box oil should be checked every 5 hours. With the aircraft level, remove the filler plug. Hold a small, clean, 3 inch length of wire level and insert it into the filler hole approximately ¼” past the inner edge of the hole. Tilt it down until the tip is approximately level with the bottom of the hole and remove. A drop of oil should remain on the end of the wire. If the wire is dry, slowly add oil until it begins to run out of the hole. Reinstall fill plug.

Oil should be drained and refilled after the first 5 hours of operation. 100% Power Punch or Lucas oil additive is recommended. After the first oil change oil should be changed every 100 hours.

7. SAFETY AND MAINTENANCE SUPPLEMENT

Always store the aircraft in an enclosed, dry space to prevent corrosion to critical components of the aircraft.

Avoid flight through rain or snow. If precipitation is encountered during flight dry the aircraft thoroughly on landing and regrease fittings.

Do not carry any additional loads on or under the helicopter. Shifting of the load during flight can cause an unbalanced condition resulting in loss of control.

Ensure all articles on the aircraft and pilot are secured in place. Loose articles can fly back into the tail rotor resulting in damage and potential loss of control.

Avoid all abrupt control movements to prevent loss of control or overstressing critical components.

Never leave the aircraft with the engine running or rotor spinning.

Ensure all is clear during rotor run up.

Never lift the collective lever when the rotor speed is not in the green range. Collective pitch at low rotor rpm can lead to excessive flapping resulting in damage to the blade stops and or rotor/rotor head components. Do not use collective pitch to slow the rotor.

Never begin flight operations with a low fuel condition. The fuel tank should be a minimum of 2/3 full at the beginning of each flight.

8. FLIGHT ENVELOPE

To maximize flight safety all helicopters must only be operated within certain areas of the Height/Velocity regime. If the Mosquito is above a level at which it can safely hover-autorotate to the ground (10 feet), it must be at a minimum of 250 feet before hovering is again permitted. In the event of an engine failure while hovering at altitudes between 10 and 250 feet, the rotor blades will not have sufficient inertia to maintain rpm and there will not be sufficient time for the helicopter to build adequate forward speed for a normal autorotation.

In the event of an engine failure while operating the Mosquito at low altitudes and high forward speed the aircraft will not have time to lose sufficient forward speed for a normal autorotational landing prior to contact with the ground.

NOTICE:

Flight operation within the shaded areas of the Height/Velocity diagram can result in serious injury or death! Flight operation within the shaded areas of the diagram is strictly prohibited!