ENSTROM 280FX OPERATOR'S MANUAL

AND

FAA APPROVED ROTORCRAFT FLIGHT MANUAL

REPORT NO. 28-AC-020

Revision 14, dated Sep 12, 2024, applies to the Enstrom 208FX Operator's and FAA Approved Rotorcraft Flight Manual. Incorporate this revision by removing and inserting the pages listed below.

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ENSTROM
HELICOPTER CORPORATION

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LOG OF REVISIONS

Rev. No.	Date	FAA Approved
1	Jul 12/85	G. Louser
2	Dec 14/88	P. Moe
3	May 22/89	P. Moe
4	Jan 11/91	R. Adler
5	Jun 8/07	J. Miess
6	Mar 26/12	S. Lardinois
7	Jul 9/12	J. Miess
8	Feb 11/13	J. Miess
9	Nov 26/13	R. D. McElroy
10	Jul 27/15	R. D. McElroy
11	Oct 25/17	E. Kinney
12	Mar 12/19	D. Barbini
13	Aug 14/20	R. Nelson **FAA Approved by Manager, Southwest Flight Test Section, AIR-713 Federal Aviation Administration Ft. Worth, TX**

14	FAA APPROVAL	SUMMARY DESCRIPTION
		General updates
	RYAN B NELSON Digitally signed by RYAN B NELSON Date: 2024.10.18 [illegible] FTP, AIR-712, *for*	18 Oct 2024
	Manager, Flight Test & Human Factors Branch, AIR-710 Federal Aviation Administration	Approved Date

NOTE: All revisions are indicated by a black vertical line.

EASA LOG OF REVISIONS

Rev. No.	Date	EASA Approved
1	Sep 28/03	Article 3, Commission Regulation (EU) 748/2012
2	Sep 28/03	Article 3, Commission Regulation (EU) 748/2012
3	Sep 28/03	Article 3, Commission Regulation (EU) 748/2012
4	Sep 28/03	Article 3, Commission Regulation (EU) 748/2012
5	Jul 4/14	EASA 10049746
6	Jun 9/15	EASA 10053596
7	Jul 9/15	FAA/EASA T.I.P.; FAA Approved on Behalf of EASA by G. Michalik*
8	Jun 9/15	EASA 10053594
9	Jul 9/15	FAA/EASA T.I.P.; FAA Approved on Behalf of EASA by G. Michalik*
10	Feb 13/17	FAA/EASA T.I.P.; FAA Approved on Behalf of EASA by G. Michalik♦
11	Apr 5/18	FAA/EASA T.I.P.; FAA Approved on Behalf of EASA by M. Runyan▲
12	Mar 12/19	FAA/EASA T.I.P.; FAA Approved on Behalf of EASA by M. Javed▲
13	Aug 14/20	FAA/EASA T.I.P.; FAA Approved on Behalf of EASA by J. Miess▲
14	Oct 18/24	FAA/EASA T.I.P.; EASA Approved ●

* T.I.P., Rev. 4 dated September 22, 2014, Section 3.2.11
♦ T.I.P., Rev. 5 dated September 15, 2015, Section 3.2.11
▲ T.I.P., Rev. 6 dated September 22, 2017, Section 3.5.12
● T.I.P., Rev. 7 dated October 19, 2023, Sections 3.3 and 3.5.12.4

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SECTION 2. OPERATING LIMITATIONS

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7. The lateral datum line is the centerline of the helicopter. Lateral moment arms are positive right and negative left.

8. Lateral offset moment limits vary with weight (reference Figure 6-2).

   a. From 2025 lb to 2600 lb, limits are -3250 in-lb and +3700 in-lb.

   b. Below 2025 lb, reference Figure 6-2.

2-4. Airspeed

Power-on never exceed speed (V_{NE}) is 117 MPH, IAS, sea level to 3000 ft density altitude. Reference Figure 5-1 for variations above 3000 ft and for variations with gross weight/c.g. V_{NE} for autorotation is 85 MPH or the power-on V_{NE}, whichever is lower.

NOTE

There are four V_{NE}/altitude envelopes that apply to this helicopter. Each envelope corresponds to one of four gross weight /c.g. envelopes (reference Figure 5-1).

2-5. Altitude

Maximum approved operating altitude is 12,000 ft density altitude at 2350 lb. For variations of altitude with gross weight, reference Figure 5-1.

NOTE

Takeoffs and landings at 2600 lb gross weight were demonstrated to 7000 ft density altitude in all wind conditions up to 20 MPH. DO NOT EXCEED ENGINE LIMITATIONS.

NOTE

Takeoffs and landings at 2350 lb gross weight were demonstrated to 10,000 ft density altitude in all wind conditions up to 15 MPH.

NOTE

Operators should use appropriate caution above 10,000 ft density altitude and in winds greater than 15 MPH to ensure safe takeoffs and landings.

2-6. Rotor RPM

1. Flight limitations power on:

Minimum	334 RPM
Maximum	(Not Applicable)

2. Flight limitations power off:

Minimum	334 RPM
Maximum	385 RPM

3. Reference Section 8 for adjustment procedures.

NOTE

During transient maneuvers, such as simulated power failure during pilot training, the rotor RPM may fall below 334. These maneuvers have been demonstrated with rotor RPM dropping briefly to 280; however, sufficient time and altitude must be available to regain RPM.

NOTE

The helicopter is equipped with a rotor RPM warning device. Operating the helicopter below 334 RPM with the collective off the down stop will automatically activate a warning horn.

2-7. Power Plant Limitations – Lycoming HIO-360-F1AD with Turbocharger

(Turbocharger installation per STC SE484GL).

1. Maximum continuous power		225 hp, 3050 RPM, 39.0 in MP, sea level to 12,000 ft	
2. Engine operating RPM		Minimum	2900 RPM
		Maximum	3050 RPM
3. Engine idle RPM (clutch disengaged)		Minimum	1450 RPM
		Maximum	1500 RPM
4. Manifold pressure		39.0 in Hg maximum, sea level to 12,000 ft	
5. Cylinder head temperature		500°F maximum	
6. TIT		1650°F maximum	
7. Fuel		100/130 aviation grade gasoline (green)	
		100LL aviation grade gasoline (blue)	
8. Fuel mixture setting	29 in MP or below	Maximum fuel flow - full rich	
		Minimum fuel flow - leaned to 1650°F rich side of peak	
	29 in MP to 39.0 in MP	Full rich	
9. Oil temperature		245°F maximum	
10. Oil pressure	Maximum starting and warm-up		100 psi
	Normal operating		60-90 psi
	Minimum idling		25 psi

2-8. Transmissions Limitations

1. Transmission oil temperature

Maximum	225°F

2-9. Restrictions

1. Instrument flight is prohibited.
2. Aerobatic maneuvers are prohibited.
3. Hovering IGE above 10,000 ft density altitude is limited to five minutes.
4. The aft landing light must not be used for ground or hover in ground effect operations.

2-10. Minimum Crew

1. One pilot.
2. Solo from left seat only.

2-11. Instrument Markings

1. Rotor tachometer

334 RPM	red line
334-385 RPM	green arc
385 RPM	red line

2. Engine tachometer

2900 RPM	red line
2900-3050 RPM	green arc
3050 RPM	red line

3. Maximum airspeed

85 MPH (Power off)	blue line or red cross-hatched line
117 MPH (Power on)	red line

4. Manifold pressure

10 in to 39 in Hg	green arc
39.0 in Hg	red line
Overboost light illuminates at approximately 39 in manifold pressure.	

5. Engine oil temperature

245°F	red line
120°-245°F	green arc
60°-120°F	yellow arc

6. Engine oil pressure

100 psi	red line
60-100 psi	green arc
25-60 psi	yellow arc
25 psi	red line

7. Cylinder head temperature

500°F	red line
200°-500°F	green arc

8. Turbine inlet temperature

1650°F	Maximum (digital readout with placard)

9. Transmission oil temperature

225°F	red line
0°-225°F	green arc

2-12. Placards

1. Placards that are required to be placed in view of the pilot are:

   a.

THIS HELICOPTER MUST BE OPERATED IN COMPLIANCE WITH THE OPERATING LIMITATIONS SPECIFIED IN THE FAA APPROVED ROTORCRAFT FLIGHT MANUAL

   b. Placards for 280FX V_{NE} (located overhead above center windshield):

      (1) V_{NE} placards shown in Figure 2-1 and Figure 2-2 are used on all 280FX helicopters serial number 2132 and prior.

      (2) V_{NE} placards shown in Figure 2-3 and Figure 2-4 are used on all 280FX helicopters serial number 2133 and subsequent. 280FX helicopters serial number 2132 and prior may also use these placards.

   c. Smoking restrictions – (This placard is not required if approved ashtray is installed.)

NO SMOKING

   d.

THIS HELICOPTER IS APPROVED FOR OPERATION UNDER DAY AND NIGHT VFR NON-ICING CONDITIONS ONLY

   e. This placard is to be placed adjacent to the collective friction device.

COLLECTIVE FRICTION TO BE USED FOR GROUND OPERATION ONLY

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SECTION 4. NORMAL PROCEDURES

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9. Upper inspection door
   a. Swashplate and control rods – check condition and security.
   b. Fuel tank and lines – check for leaks and lines and fitting secure.
   c. Fire curtain – check condition.
10. Kick-in step door
    a. Belt drive system – check security and condition of idler pulley, and main drive belt.
    b. Tail rotor drive shaft – check condition of flex coupling.
    c. Rotor tach drive – check condition.
    d. Cooling fan – check condition.
    e. Check main rotor gearbox sight gauge. Normal level is halfway mark on sight gauge.
11. Right fuel tank
    a. Check for leaks, check fuel quantity and cap secured.

NOTE

When checking the fuel quantity, Enstrom recommends using a calibrated dipstick.

CAUTION

If the fuel level indication on the dipstick is lower than 1/4, take-off is <u>not recommended.</u>

12. From steps
    a. Check main rotor gearbox filler cap closed.
    b. Check area between fuel tanks for leaks and obstruction to air flow.
    c. Main rotor shaft – check condition.

d. Main rotor blades – security and condition, no bond separations, cracks or corrosion. Main rotor retention pins secured.

e. Check main rotor hub for security of all fasteners, no cracks or obvious damage.

f. Main rotor pitch links – check for binding or looseness.

g. Main rotor dampers – check for security and no leakage.

13. Baggage box

a. Check contents secured. Observe weight limitations.

b. Baggage box door secured.

14. Right static port – check unobstructed.

15. Right tail cone – check condition.

16. Tail rotor drive shaft – check condition and security of drive shaft, hangar bearings and flex couplings

17. Right horizontal stabilizer – check condition and security.

18. Right vertical stabilizer – check condition and security.

19. Right position and anti-collision lights – check security.

20. Tail rotor

a. Control cables – check condition, tension, and security.

b. Tail rotor transmission – check for oil leakage and check oil quantity. The minimum oil level required for operation is at half or more than half-filled sight gauge. Check for security of attachment.

c. Tail rotor guard – check for security and evidence of strike damage.

d. Pitch change mechanism – check condition and operation. Check pitch links for binding or looseness and check hardware for security.

and condition and security of blade tape, if installed.

34. Check operation of all lights for night flight.

4-6. Before Starting Engine

1. Seat belts fastened and doors latched.
2. Heater as desired (in for OFF).
3. Check magnetic compass.
4. Altimeter set to field elevation.
5. Radio(s) OFF.
6. All switches OFF.
7. Circuit breakers set (pushed in).
8. Fuel valve ON (pushed in).
9. Flight controls – check for full travel. Center cyclic and pedals.
10. Collective full down and locked.
11. Set throttle friction so that slight effort is required to rotate the throttle.

NOTE

For the throttle correlator to operate correctly, the throttle friction must be set high enough to prevent the throttle grip from turning on its own when the collective is raised or lowered.

12. Throttle OFF.
13. Rotor clutch disengaged.

CAUTION

Starting helicopter with clutch engaged will not damage rotor system but will severely overload the starter motor.

14. Mixture control in idle cutoff (ICO) position.

4-7. Starting Engine

1. Master switch ON.

2. Starter relay switch/CB ON.

3. Ignition switch ON to BOTH.

4. Throttle open (full).

5. Mixture control full rich.

6. Boost pump ON (1-8 seconds).

NOTE

The length of time the boost pump is run depends upon the temperature of the engine. If the engine is cold soaked in cold temperatures, it may require 8 seconds or more. If the engine has just been run, it may require one second or less.

7. Boost pump OFF.

8. Mixture control to idle cutoff (ICO).

9. Throttle closed. Then open to start position (i.e., index up). Reference Section 7, "Aircraft and Systems Description".

CAUTION

Excessive throttle opening on starting will result in an engine overspeed which results in severe engine damage.

10. Engage starter button. When engine fires, release starter button and push mixture control to full rich.

NOTE

If engine fails to start within 2-3 seconds, release starter button; prime engine using steps 4-9.

11. Turn fuel boost pump ON.

12. Check engine oil pressure off "0" mark within 30 seconds.

13. Disconnect APU (if used).

14. Alternator ON.

15. Check engine idle speed; should be 1450 to 1500 RPM.

NOTE

Mixture and RPM must be adjusted for change in base altitude. (Reference the F-28F/280F Series Maintenance Manual Paragraph 13-4. D, (8). Adjustments should be performed by maintenance personnel only.)

16. AV MA, accessory switches ON, and headset(s) ON.

17. When engine oil pressure is above 25 psi and engine is running smoothly, rotor may be engaged.

4-8. Starting Hot or Flooded Engine

1. Hot engine
    a. Prime engine 0-3 seconds.
    b. Throttle back to start (i.e., index up).
    c. Engage starter button. When engine fires, release starter button and push mixture control to full rich.
    d. Proceed with normal starting procedure (para. 4-7, steps 11-17).

NOTE

If engine fails to start after 2-3 seconds, slowly move mixture control to full rich position while cranking engine. DO NOT engage starter for more than 5 seconds in full rich position.

2. Flooded engine
   a. Ignition switch in **OFF** position, throttle full open and mixture control in ICO.
   b. Press starter and crank engine for 3-5 seconds.
   c. Throttle closed, then open to start index up position. Ignition switch ON and proceed with normal starting sequence (para. 4-7).

4-9. Rotor Engagement

1. Check collective down and locked.

CAUTION

Heavy spring capsule forces are present with zero or low rotor RPM, and damage to the helicopter and engine can result if the collective is allowed to rise.

CAUTION

Collective friction is to be used for ground operation only.

2. Check pedals in neutral position.
3. Center cyclic with trim motors.
4. Check area for personnel and obstructions.
5. Maintain throttle in idle position (1450-1500 RPM) and slowly engage clutch until engine RPM drops to 1100-1200 RPM.

6. When rotor RPM reaches 100 RPM, fully engage clutch.

NOTE

The clutch disengage warning light will go out and the rotor RPM warning light will come on when the clutch is fully engaged.

7. Place clutch handle in stowed position.

WARNING

Severe engine damage and complete loss of power to rotor system will result if the manual clutch is disengaged under any condition other than throttle at idle position.

4-10. Operational Checks

NOTE

Mixture and RPM adjustments may be required for change in base altitude.

1. Advance throttle to 1800 RPM and wait for cylinder head temperature to reach 200°F.
2. After reaching 200°F cylinder head temperature, slowly advance throttle to 2300 RPM and wait until oil temperature reads 80°F.
3. Advance throttle to 3050 RPM. Low rotor RPM warning light should go out at 334 rotor RPM (2900 engine RPM).
4. Check fuel flow 65-70 lb/hr (engine cold) (50-65 lb/hr engine warm).
   a. Adjust the fuel flow as required to attain 50-70 lb/hr (as required) at full RPM (thus raising TIT and reducing manifold pressure.)
5. Check manifold pressure 16-18 inches.

6. Move ignition switch to left position. Maximum 125 RPM drop allowable in 5 seconds and maximum of 100°F rise in TIT. Return switch to BOTH position and let RPM stabilize. Move switch to right position. Maximum 125 RPM drop and maximum 100°F TIT rise allowable. Return switch to the BOTH position.

NOTE

Engine should not run rough when operating on one magneto.

7. Check engine driven fuel pump by turning off boost pump and checking for no change in engine operation. Observe red fuel pressure light on when boost pump is off. Return boost pump switch to ON position and observe proper light indication(s).

8. Gently close throttle to split tachometer needles to check proper operation of overrunning clutch. When needles join, return to operating RPM.

4-11. Before Takeoff

Check the following items for proper position or indication.

1. Seatbelts and doors latched.
2. Fuel valve ON (in).
3. Ammeter.
4. Main rotor gearbox temperature.
5. Fuel quantity.
6. Cylinder head temperature.
7. Engine oil temperature.
8. Engine oil pressure.
9. Mixture control set for 50-70 lb/hr fuel flow (as required).

10. Boost pump ON and low fuel pressure light is off.

11. Anti-collision and other lights ON, as required.

12. Annunciator panel – press to test – all lights should be on when button is pushed.

13. Throttle friction.

14. Release collective lock.

WARNING

Keep hand on collective and maintain down position when lock is disengaged.

4-12. Takeoff to Hover

1. Cyclic in neutral position.

2. Set engine RPM to 3000 RPM with collective full down.

NOTE

As throttle is increased to 3050 engine RPM, the rotor RPM warning light will go out when main rotor reaches 334 RPM.

3. Slowly and smoothly increase collective pitch and adjust throttle as required to maintain RPM in the green arc while raising collective to lift helicopter off the ground. The correlator will maintain RPM in the green if the throttle grip is not allowed to move, and if the helicopter is flown smoothly.

4. Check TIT 1450-1550°F.
   a. If TIT is above 1550°F, land and richen the mixture slightly.
   b. If TIT is below 1450°F, the mixture can be leaned for more power.

NOTE

This helicopter is equipped with a mechanical throttle correlation device. The correlator will compensate for changes in collective pitch when manifold pressure is above 25 inches Hg and will maintain RPM within the normal operating range for normal hover maneuvering.

NOTE

Hovering IGE above 10,000 ft density altitude is limited to 5 minutes.

CAUTION

Avoid maneuvers that require full pedal travel or rapid pedal reversals.

4-13. Normal Takeoff

1. Align helicopter with desired takeoff course at a stabilized hover height of approximately 2 ft.
2. Check power required to hover.
3. Smoothly apply forward cyclic to begin acceleration into effective translational lift.
4. As the helicopter begins forward movement, maintain altitude by increasing collective pitch.

NOTE

Adjust acceleration rate so approximately 1-2 inches of manifold pressure over hover power is required. Maintain 2 ft hover altitude or lower altitude if permitted by safe obstacle or terrain clearance.

NOTE

During smooth transition into a climb from a hover, there is a tendency for the RPM to climb and exceed the red line. The pilot should

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SECTION 6. WEIGHT/BALANCE AND LOADING

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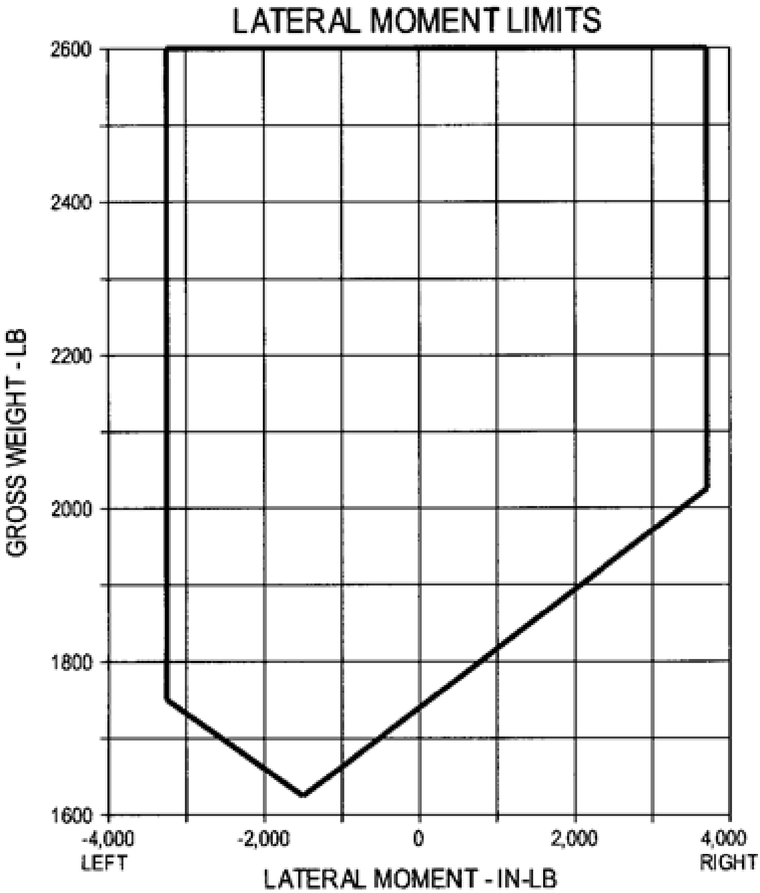

Figure 6-2. Lateral Offset Moment Envelope

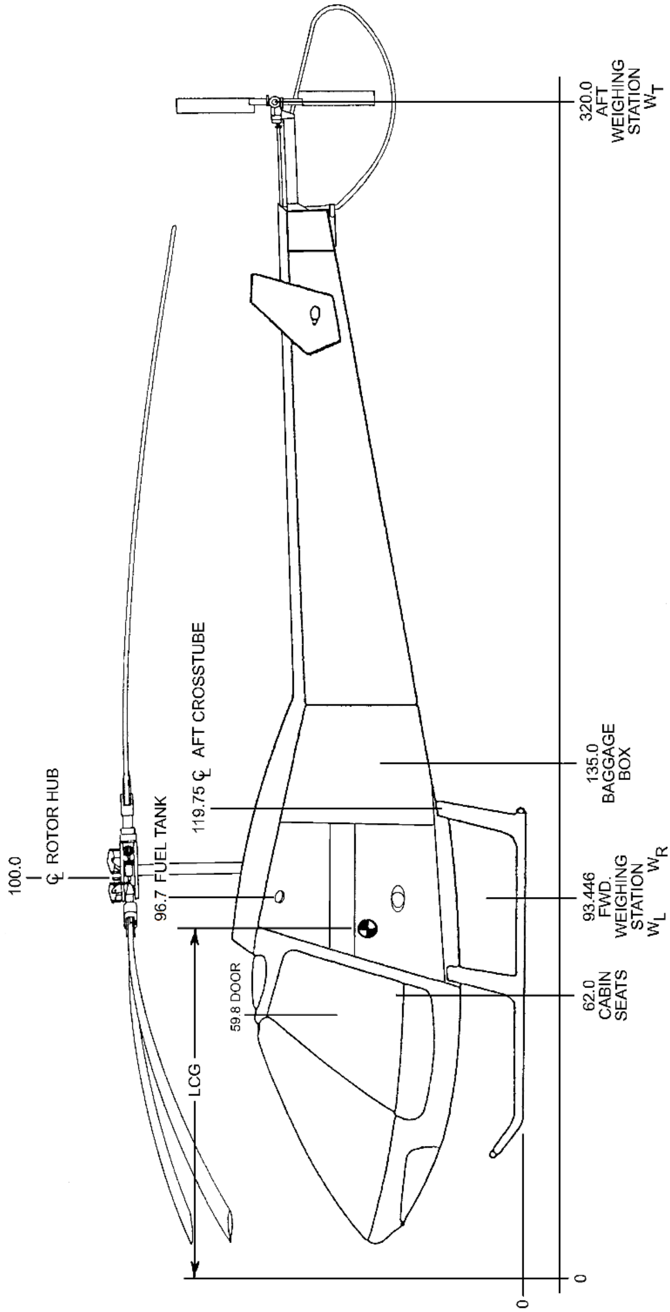

Figure 6-3. 280FX CG Diagram

6-3. Loading Information

1. It is the responsibility of the helicopter pilot to ensure that the helicopter is loaded properly. Using the running basic weight and moment from the Weight and Balance form (Figure 6-7) and the Loading Chart (Figure 6-4), the pilot can obtain the total weight and moment for various loading conditions. The pilot should first calculate the total weight and moment for zero usable fuel, as this will show the c.g. shift with fuel burn-off. If the c.g. is within limits, add the planned fuel load and compute the c.g. If the c.g. is within limits, the last item to check is the lateral offset moment using the stations in Paragraph 6-2, Step 2 and Figure 6-2.

2. Sample calculation – Longitudinal C.G.

	Sample Helicopter			S/N:_______	
SAMPLE LOADING	Arm (in)	Weight (lb)	Moment (1000 in-lb)	Weight (lb)	Moment (in-lb)
a. Basic empty weight from Figure 6-7	100.7	1610.0	162.1		
b. Pilot and passengers cabin seats	62.0	480.0	29.8(1)		
c. Baggage compartment load	135.0	20.0	2.7(1)		
d. Total weight and moment with zero usable fuel to check c.g. shift with fuel burn-off (landing condition)	92.2(2)	2110.0	194.6		
e. Usable fuel	96.7	240.0	23.2(1)		
f. Total weight and moment with usable fuel (takeoff condition)	92.6(2)	2350.0(3)	217.6		

(1) Moments obtained by multiplying weight times arm or from Loading Chart, Figure 6-4.

(2) The longitudinal c.g. relative to the datum line is found by dividing the moment by the weight.

$$\text{c.g. zero fuel} = \frac{194{,}600 \text{ in-lb}}{2110.0 \text{ lb}} = 92.2 \text{ inches}$$

$$\text{c.g. full fuel} = \frac{217{,}600 \text{ in-lb}}{2350.0 \text{ lb}} = 92.6 \text{ inches}$$

The total weight and moment can also be plotted on Figure 6-5 to determine if the loading is within longitudinal limits.

(3) Maximum gross weight is 2600 lb (reference Figure 6-1).

3. Sample Calculation – Lateral Offset Moment

	Sample Helicopter		
SAMPLE LOADING	Arm (in)	Weight (lb)	Moment (in-lb)
a. Pilot (left seat)	-13.5	170	-2295
b. Passenger (center seat)	+3.0	140	+420
c. Passenger (right seat)	+20.5	170	+3485
d. Total			+1610

a. Plot 2350 lb and +1610 in-lb on Figure 6-2 to ensure moment is in approved area.

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circuit breaker panel. For starting and normal operation, place the switch in the “both” position.

d. Ignition Circuit Breaker. This circuit breaker closes the circuit to the starter button on the collective control.

e. Starter Button. The starter button is located on the end of the pilot collective control (and the copilot collective control, if equipped with dual start). Push to engage.

f. Master Switch. The master switch is located on the left side of the switch circuit breaker panel. It is a single-throw, two-position switch.

3. Turbocharger

The turbocharger unit has only one moving part: a rotating shaft with a turbine wheel on one end and a compressor impeller on the other. Both the turbine wheel and the compressor impeller are precision balanced and contained in their own housings. The turbine wheel, driven by exhaust gas energy, drives the impeller that compresses intake air to a density greater than sea level and delivers it to the engine intake. This increased mass of air allows the engine to “breathe” with the same volumetric efficiency that it does at low altitudes. The engine can produce 225 HP at all altitudes up to 12,000 ft density altitude.

4. Wastegate

The wastegate is a valve that controls the amount of exhaust gases directed to the turbocharger. The valve is located on the exhaust manifold just upstream of the turbine inlet. The valve is controlled by mechanical linkage connected to the fuel servo throttle valve.

7-5. Turbine Inlet Temperature System

The turbine inlet temperature (TIT) is used for fuel mixture leaning in cruising flight. TIT is obtained from a temperature probe located on the exhaust stack just before the inlet to the turbocharger. This allows an actual temperature measurement of the exhaust gases that are delivered into the turbocharger unit. Maximum allowable TIT is 1650°F.

TIT is displayed on a Graphic Engine Monitor (GEM) Model 603 or 610 (S/N 2139 and prior) or an Engine Data Management (EDM) Model 700 (aircraft S/N 2140 through 2173) or (GEM) Model 610C (G2) (S/N 2174 and subsequent).

NOTE

The GEM 603 Model displays turbine inlet temperature (TIT), as a three-digit number (the fourth digit is assumed to be zero (i.e., 165 indicates 1650°F)).

The GEM and EDM models display exhaust gas temperature (EGT) and cylinder head temperature (CHT) in bar graphs, one for each cylinder. TIT is displayed digitally for both models and is also displayed in bar graph on the EDM model. The GEM 610, 610C (G2), and EDM-700 also display EGT, CHT, and outside air temperature (OAT) digitally. The EDM-700 also monitors and displays rate of change of CHT (CLD), maximum EGT differential (DIF), and voltage (BAT). Aircraft limitations are based on the CHT indicator in the instrument cluster. CHT indications on the engine monitor are informational only.

1. The EDM-700 initially starts in Manual mode and switches to Automatic mode after power up (two minutes). In Automatic mode, the display automatically sequences through parameter values. In Manual mode, display parameters are manually indexed. Tap the STEP button to enter Manual mode. Tap the LF button, then the STEP button to enter Automatic mode.

   Fuel mixture leaning should be done in Manual mode. Once leaned, monitoring can continue in either mode.

CAUTION

Fuel mixture leaning by means of the EDM-700 LeanFind mode is not recommended.

2. Tapping the LF button initiates the EDM-700 LeanFind mode to assist leaning. The LeanFind mode is more effective on normally aspirated engines than turbocharged installations. LeanFind mode will allow TIT to briefly exceed published limits; therefore, use of this mode is not recommended.

   Tap the STEP button to terminate the LeanFind mode and change to Automatic mode.

NOTE

Limits will reset to factory defaults when the display is switched between Fahrenheit and Celsius.

3. The EDM-700 has programmable alarms. The alarm limits are based on factory default settings but may be modified. Recommended alarm limit values are defined in Table 7-1. The operator may choose to reduce these to provide additional margins or increase engine life. Lycoming and various industry groups have additional guidance.

   Tapping the STEP button will clear the alarm from the screen for 10 minutes. Holding the STEP button until the word OFF is displayed will turn off the alarm until the EDM-700 power is cycled off then on.

Table 7-1. EDM-700 Recommended Alarm Limit Values

Parameter	**Description**	**Recommended Limit**
CHT	Cylinder head temperature	500°F (260°C)
TIT	Turbine inlet temperature	1650°F (900°C)
CLD	Cylinder head cooling rate	-100°F/min (-55°C/min)
DIF	Difference between highest and lowest EGT values	500°F (280°C)
H BAT	Battery high voltage limit	30.0V
L BAT	Battery low voltage limit	24.5V

4. The EDM-700 also monitors EGTs for signs of pre-ignition. This will appear as a sudden redline in EGT and the affected cylinder column(s) will flash while the display will show an EGT higher than 2000°F. At this temperature pre-ignition can destroy your engine in less than one minute unless immediate corrective action is taken. Corrective action may entail reducing power or enriching the mixture.

Refer to the Insight Avionics GEM 603/610/610C (G2) Series Pilot's Guide or the J. P. Instruments EDM-700 Pilot's Guide for additional information.

7-6. Cabin Heat

The cabin heat control is located on the right-hand side of the pilot's seat, just to the left of the clutch. By moving the control in or out, the operator regulates the amount of cabin heat through the main output louvers located in the center of the seat structure and two smaller louvers located just forward of the tail rotor control pedals on both sides of the cabin floor.

7-7. Clutch Engaging Lever

The clutch engagement lever is located at the right side of the pilot's seat on the forward face of the seat structure. The clutch lever is provided as a means of engaging and disengaging the rotor drive system. A red warning light (CLUTCH ENGAGE) illuminates when the master switch is on and the clutch is disengaged.

The rotor drive system is engaged by pulling the clutch lever upward and rearward until the lever hits the stop and the warning light goes out. The handle can then be stowed by lifting it straight up and pivoting it down to the floor. When it is in the stowed position, the handle should

lie flat on the floor. If it does not lie flat on the floor in the stowed position, the clutch rigging should be checked as described in Section 11 of the Maintenance Manual. The clutch lever must be stowed whenever the rotor drive system is engaged.

CHAPTER 8. HANDLING, SERVICING, AND MAINTENANCE

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b. Servicing – Main Transmission

The transmission filler is located on the top of the transmission. It has a spring-loaded cap and an o-ring for proper sealing. A screen inside of the filler filters any foreign material during replenishment.

(1) Reinstall the self-sealing base of the magnetic chip detector, using .032" safety wire.

NOTE

It is permissible to safety the base fitting to the pylon tube after wrapping tube with a suitable protective tape.

(2) Service transmission with 5.5 pints of authorized lubricant (reference Table 8-2).

(3) Visually inspect transmission for any evidence of leaks.

5. Over-Running Clutch

Service the overrunning clutch as follows:

(1) Turn clutch until two screws are horizontal and the third screw is above.

(2) Remove the top screw and one of the side screws. If clutch is properly serviced, oil will seep from the side hole.

(3) Add oil through top hole (reference Table 8-3). Due to the location of the drilled oil passage, it is possible for the sprags to partially block the hole, so that the clutch will take oil very slowly. Adding oil under pressure, using a spring-type oiler, can speed servicing. Add oil until a positive stream of oil comes from side hole.

(4) Rotate side hole slightly above horizontal and refill again. Refer to Enstrom Service Information Letter 0079A.

Table 8-3. Overrunning Clutch Lubrication Specifications

TEMPERATURE RANGE	SPECIFICATION
-40°F to +120°F	MIL-PRF-7808 (MIL-L-7808)
-40°F to +120°F	MIL-PRF-23699 (MIL-L-23699)

6. Tail Rotor Transmission

The tail rotor transmission is located on the aft end of the tail cone extension tube. It transfers power from tail rotor drive shaft to the tail rotor assembly. On the aft side of the transmission is a sight gauge for visually checking for proper oil level. The gauge should indicate filled to at least half of the sight gauge with the aircraft in a relatively level position. (If bubbles are present in the sight glass, raise and lower the tail to change the attitude of the helicopter to clear any bubbles from the sight glass.) If the sight gauge indicates less than half, the transmission must be serviced before flight.

The tail rotor transmission oil capacity is 5 fluid ounces (US)/0.15 L. Refer to Table 8-4 for the approved oils for servicing the tail rotor transmission.

Table 8-4. Approved Tail Rotor Transmission Oil

MANUFACTURER	MANUFACTURER'S DESIGNATION
Exxon Mobile Corporation	Mobil 1 Synthetic Gear Lubricant LS 75W-90 Mobil Delvac Synthetic Gear Oil 75W-90 Mobilube HD LS 80W-90 Mobilube HD Plus 80W-90
Shell Oil Company	Shell Helix Racing Gear Oil 75W-90
Exxon	Exxon Gear Oil GX 80W-90 Exxon Synthetic Gear Oil (SGO) 75W-90
Esso	Esso Gear Oil GX 75W-90 Esso Gear Oil GX Extra 75W-90
BP Lubricants USA, Inc.	Castrol Syntrax Limited Slip 75W-90 (Syntec Gear Oil)

a. Draining – Tail Rotor Transmission

There is a magnetic chip detector located on the bottom of the transmission and a filler plug located just above the sight gauge. The chip detector unit consists of two parts: a quick removable chip detector and a self-sealing base fitting (refer to para. 8-5, item 11 for additional information).

(1) Remove safety wire and filler plug.

(2) Remove magnetic chip detector, inspect for chips.

(3) Remove the self-sealing base of chip detector and completely drain oil into a suitable container.

(4) Remove and replace crush washer on chip detector base.

(5) Inspect condition of o-ring of filler plug. Replace if necessary.

b. Servicing – Tail Rotor Transmission

(1) Reinstall chip detector base and chip detector.

(2) Using a suitable clean squirt can, add oil through the filler port until oil begins to flow from the filler port.

(3) Install filler plug (torque 20 in-lb/2.3 Nm).

(4) Safety wire the filler plug, magnetic plug/base fitting, and sight gauge with 0.032" safety wire.

(5) Visually check for oil leaks.

(6) Wipe dry any oil spillage using a clean cloth.

7. Main Rotor Dampers – P/N 28-14375

Three dampers are located in the rotor system to control the lead-lag action of the main rotor blades.

NOTE

For removal and servicing, refer to Enstrom Maintenance Manual.

Approved hydraulic fluid: SF96-20

8. Landing Gear Assembly

Oleo Struts - Four nitrogen-oil type dampers are used on the landing gear assembly to absorb landing shocks and to provide the damping required to eliminate ground resonance. The oleo is a steel tube construction with the piston assembly having a hard chrome finish. The relief valves in the piston are preset and are not to be field adjusted.

The oleos are to be inspected at each preflight and must be in working order and properly inflated before engaging rotor. Inspect as follows:

a. Check for proper inflation with back side of fuel dipstick (reference para. 4-4, step 7).

b. Check oleo for leaking oil. If leakage is noted, refer to Maintenance Manual for removal and seal replacement instructions.

c. Check attachment fittings and hardware for cracks and security. Replace all damaged or worn parts.

NOTE

Removal of the oleo struts for seal replacement and replacement of damaged or worn landing gear parts is NOT "Preventative Maintenance".

d. Servicing Oleo Strut

When the oleo strut requires nitrogen, proceed as follows:

(1) Remove landing gear fairing to gain access to oleo strut.

NOTE

Removal of the oleo struts for servicing is NOT "Preventative Maintenance".

(2) Remove strut from helicopter, or hoist helicopter clear of floor (refer to Maintenance Manual).

(3) Attach high pressure nitrogen bottle to strut valve.

(4) Adjust regulator on nitrogen bottle to desired pressure (reference Table 8-5).

(5) Loosen 3/4 inch nut valve, turn until resistance is felt, open one-half turn more; this will allow nitrogen to enter strut. Close and tighten 3/4 inch nut.

CAUTION

Ground resonance can result if helicopter is operated when oleo strut extension is incorrect.

Table 8-5. Oleo Strut Service Pressure

Strut Location	**Service Pressure**
Forward Oleo Struts	400 psi
Aft Oleo Struts	450 psi

NOTE

Check for proper extension of strut when helicopter is sitting on ground after servicing. Refer to Item 8.a above.

(6) Reinstall landing gear fairing.

9. Ground Handling Wheels

NOTE

Content has been moved to Paragraph 8-6, "Handling."

10. Transparent Plastic

The plastic cabin windows and doors provide complete visibility for the pilot and the passenger. Maintaining these plastic enclosures consists of proper cleaning procedures and good visual inspections.

NOTE

When cleaning windows with soap and water, always use a soft fiber tissue to avoid scratching or crazing. Rinse with clear water. Plastic cleaner may be used if desired.

11. Chip Detectors

The main and tail rotor chip detectors are of the quick release self-sealing type. They may be removed by pushing up to disengage the lugs and turning one-quarter turn counter-clockwise, and then pulling down. After inspection and cleaning, they may be reinstalled by aligning the lugs, pushing up and turning one-quarter turn clockwise, and releasing up-pressure.

NOTE

Operators should ensure lugs lock into place and inspect for leaks before returning aircraft to service.

12. Autorotation RPM

a. General

In order to autorotate throughout the complete range of gross weights and altitudes, the autorotation RPM must be set according to the schedule shown in Figure 8-1 or Figure 8-2. This setting was made before the helicopter left the factory and should not need to be changed if the helicopter is operated out of a base near sea level with the original blades.

If the blades are overhauled, or different blades are installed, the autorotation RPM should be checked. Blade tracking should have a very minor effect on autorotation RPM, but eventually these minor effects could add up to a significant change, so it is recommended to check the autorotation RPM after the aircraft has been tracked several times. If required, the autorotation RPM is adjusted to comply with the autorotation RPM schedule. The adjustment procedure is described in Section 12 of the maintenance manual.

NOTE

Autorotation RPM adjustments may only be performed by an appropriately rated mechanic.

b. Autorotation RPM Check

The autorotation RPM should be adjusted to comply with the schedules shown in Figures 8-1 or 8-2. Figure 8-1 should be used if the helicopter is based at a location below 6000 ft. Figure 8-2 should be used if the helicopter is based at a location above 6000 ft. To check the autorotation RPM, proceed as follows:

(1) Determine the weight of the helicopter as it will be flown during the RPM check (reference Section 6). It is important to accurately know the gross weight of the helicopter including fuel and occupants when the RPM is recorded in step (6).

(2) Set the altimeter to 29.92 in Hg (1013 mbar) (pressure altitude).

(3) Climb to an altitude that allows a safe recovery from autorotation. Record altitude and temperature.

WARNING

Autorotation should be entered at a high enough altitude to allow the pilot to stabilize the autorotation, record the data, and recover at a safe altitude and conducted over a suitable landing area in case of engine failure.

(4) Climb an additional 500 ft (or to an altitude sufficient to permit a stabilized autorotation while descending through the previous recorded altitude).

(5) Establish the helicopter in a stabilized autorotation at 60 MPH with the collective full down. Do not allow the rotor RPM to exceed 385 RPM or to fall below 334 RPM.

(6) Record rotor RPM passing through the altitude from step (3).

(7) Compare the rotor RPM, outside air temperature (OAT), and pressure altitude readings with the information provided in Figure 8-1 or Figure 8-2, as appropriate. The actual RPM should be within ± 5 RPM of the chart.

(8) If the RPM is not correct as indicated by the appropriate schedule, maintenance action is required to adjust the autorotation RPM.

(9) If the RPM is adjusted, re-check the RPM as described in steps (1) through (7) of this procedure.

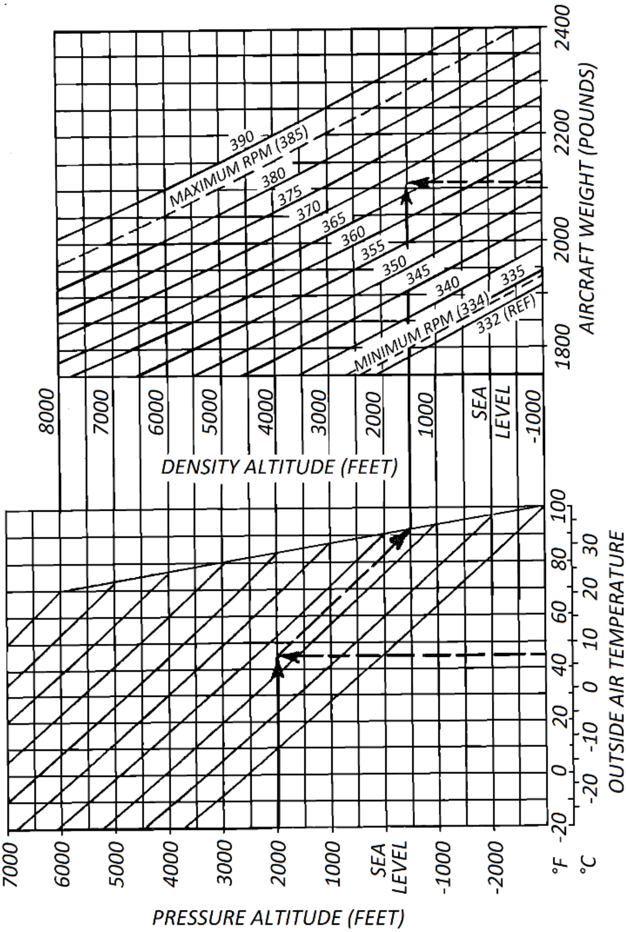

Figure 8-1. Autorotation RPM Schedule for Sea Level Base Altitude

Example:

RPM checked passing through 2000 ft pressure altitude. OAT at this altitude: 45°F (7°C); Density altitude is 1500 ft; Aircraft weight when RPM was checked: 2110 lb.
* Autorotation RPM should be 367 with collective full down.

Check RPM in steady 60 MPH autorotation with the collective full down. Record pressure altitude (altimeter set to 29.92), OAT, rotor RPM, and aircraft weight.

Do not exceed 385 RPM or drop below 334 RPM.

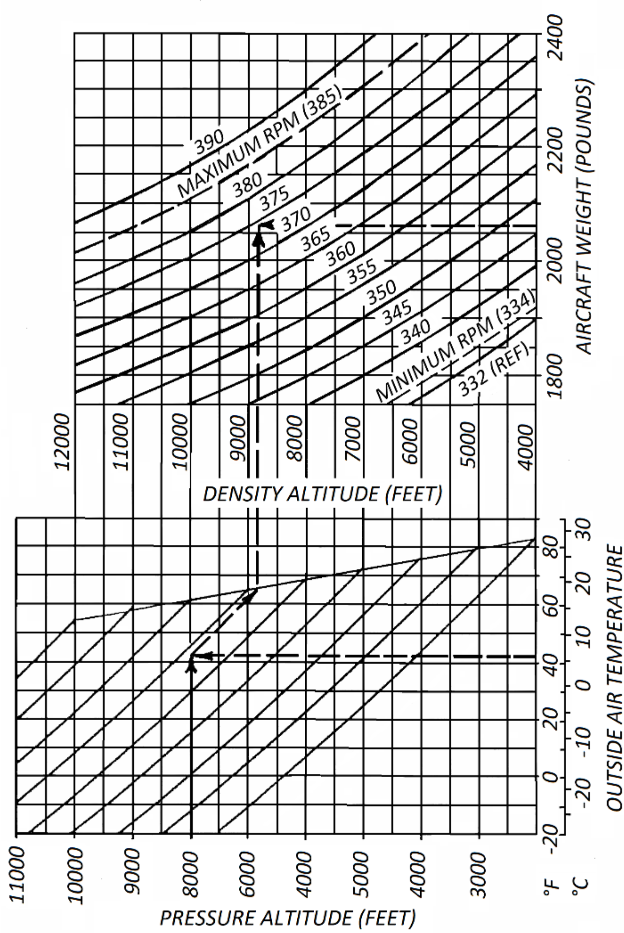

Figure 8-2. Autorotation RPM Schedule for 6000 Ft Base Altitude

Example:

RPM checked passing through 8000 ft pressure altitude. OAT at this altitude: 42°F (6°C); Density altitude is 8800 ft; Aircraft weight when RPM was checked: 2060 lb.
* Autorotation RPM should be 374 with collective full down.

Check RPM in steady 60 MPH autorotation with the collective full down. Record pressure altitude (altimeter set to 29.92), OAT, rotor RPM, and aircraft weight.

Do not exceed 385 RPM or drop below 334 RPM.

13. Blade Tape

Leading edge tape, as supplied by Enstrom Customer Service, can be installed on the leading edges of the main rotor blades. This tape will provide some corrosion protection for the main rotor blades. If this tape is installed, it must be inspected before each flight for holes, blisters, bubbles, or separation of the tape from the blade. If any defects are found, the tape must be removed, repaired, or replaced before further flight. The tape should be kept clean, just as any blade must be kept clean for maximum efficiency. Clean the tape only with soap and water. Do not use solvent on or around the blade tape.

14. Cabin Doors

NOTE

Content has been moved to Paragraph 8-6, "Handling."

15. Copilot Flight Controls

NOTE

Content has been moved to Paragraph 8-6, "Handling."

16. Idle Mixture Operational Check

NOTE

For a change in base altitude operation, it is recommended to perform an idle mixture operational check.

NOTE

Any idle mixture adjustments may only be performed by an appropriately rated mechanic.

a. Operate the helicopter to normal temperature and pressure ranges.

b. Verify the magneto operation.

   (1) Maximum engine drop: 125 RPM

   (2) Maximum TIT rise: 100 °F

c. Perform normal cool down.

   (1) 1 minute at 2000 engine RPM

   (2) 2 minutes with throttle off and clutch disengaged

d. Verify idle is between 1450-1500 RPM.

   (1) If required, perform any adjustment to the idle stop with the engine off.

e. Maintain boost pump ON.

f. Slowly lean the engine and observe engine RPM.

NOTE

Move mixture to full rich before the engine quits.

   (1) If the RPM rises during leaning – the idle mixture is rich.

   (2) If the RPM drops immediately – the idle mixture is lean.

g. Engage clutch.

   (1) Accelerate engine to 2500 RPM.

   (2) If engine stumbles during acceleration, the idle mixture is too lean.

h. If the preceding idle mixture operational check is unsatisfactory, maintenance action is required before flight.

8-6. Handling

1. Ground Handling Wheels

   a. Each skid tube has provisions for a manually operated wheel assembly. To lower the wheels (raise the aircraft):

      (1) Install wheel bar on ground handling wheel axle with the handle pointed aft.

      (2) Remove lock pin.

      (3) With a steady lifting motion, rotate bar 180° forward and install lock pin when holes line up.

      (4) To raise the wheels (lower the aircraft), reverse steps 1 through 3.

WARNING

When raising or lowering wheels with handle, care should be taken to keep bar attached to axle and hold bar firmly when engaged for rotation.

   b. The wheels should be in the "up" (retracted) position whenever the helicopter is to be run or when it is parked. The ground handling wheels are not required for flight and the assembly may easily be removed by removing the snap ring and washer from the outboard end of the shaft. Removal or installation of the wheels will change the helicopter weight and c.g. and shall be recorded on the Weight and Balance form (Figure 6-7).

   c. Servicing

      (1) Check the tire pressure, 70 to 75 psi.

      (2) Lubricate axle shaft with general purpose grease.

      (3) Lubricate wheel bearings with wheel bearing grease.

2. Cabin Doors

Operation with doors removed is approved. All loose objects and equipment within the cabin must be properly secured.

NOTE

Removal or installation of the doors will change the helicopter weight and c.g. and shall be recorded on the Weight and Balance form (Figure 6-7).

a. Door Removal (S/N 2166 and prior):

1) Remove the retaining clips on either end of the gas strut and remove the gas strut.

2) Remove the strap.

3) Remove the upper hinge bolt. Support the door while removing the bolt. Note the number of washers and their position prior to removing bolt.

4) Slightly raise the door off the bottom hinge pin and remove the door. Note the number of washers, if any, at the bottom of the hinge pin.

b. Door Removal (S/N 2167 and subsequent):

1) Open the door and hold it in the open position.

2) Remove the safety pin from the gas spring and pull the gas spring off its ball.

3) Remove the upper and lower door hinge quick disconnect pins or cotter pins and clevis pins, as applicable, and remove the door.

c. The door installation is the reversal of the steps above. Check door and door latch for proper operation.

3. Copilot Flight Controls

To accommodate additional space for passengers or equipment, the copilot's flight controls can be removed.

Refer to SIL 0179 for removal or installation instructions.

NOTE

Removal or installation of the copilot flight controls will change the helicopter weight and c.g. and shall be recorded on the Weight and Balance form (Figure 6-7).

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SECTION 9. SUPPLEMENTAL INFORMATION

GENERAL

9-1. Slope Landings

1. Slope landings have been demonstrated with the slope 90° either side of the nose up to a maximum of 15°.

CAUTION

Caution must be exercised when landing on slopes that available cyclic travel is not exceeded. Also, if any droop stop pounding is encountered as the collective is lowered the landing must be aborted and a slope with less angle selected.

9-1.1. Bird Strike

1. The probability of a damaging bird strike increases with decreasing altitude and with increasing airspeed. Operating in areas of high concentrations of birds or flocking birds also increases the probability of a bird strike. When operating at lower altitudes, including during takeoff and climb-out, flying at lower airspeeds decreases the probability of a bird strike and will reduce the severity should one occur. Though regional differences exist during spring and fall migration periods, operating at altitudes below 2,500 fee AGL increases the likelihood of a damaging bird strike.

9-1.2. Base Altitude Change

1. If the helicopter is operated out of a base at an altitude of 6000 ft or higher, the autorotation RPM should be checked and readjusted as necessary. In addition, if the helicopter was operated out of a base above 6000 ft and is moved to a lower altitude, the autorotation RPM should be checked and readjusted as necessary. Refer to Section 8, Paragraph 5-5, Sub-paragraph 12 for performing an autorotation RPM check.

2. The idle mixture should be checked and readjusted for changes in base altitude as necessary. Refer to Section 8, Paragraph 5-5, Sub-paragraph 16 for performing an idle mixture operational check.

FLIGHT CHARACTERISTICS

9-2. Retreating Blade Stall

1. Blade stall occurs at higher forward speeds when a portion of the retreating blade stalls because of the reduced relative velocity of airflow over the blade at high blade angles. When the airspeed of the tip of the retreating blade falls below a predetermined value, or when a relative blade angle exceeds a predetermined value, blade stall will be experienced. If blade pitch is increased (as with increased collective or forward cyclic control), or if the forward speed is increased, the stalled portion of the rotor disc increases, and the stall progresses from the tip toward the root of the retreating blade. During maneuvers that increase the g-load, such as sharp turns or high-speed flares from diving descents, where rapid application of collective or cyclic pitch control is involved, severe blade stall may be encountered. Severe blade stall may also be encountered in turbulent air by gust-induced load factors or corrective control applications by the pilot. In the stall condition, each main rotor blade will stall as it passes through the stall region, creating a three per rev vibration. When significant blade stall is encountered a mild roughness will be noted along with some cyclic control feedback that will cause the cyclic to have a tendency to displace aft of the trimmed position. The vibration due to the blade stall will increase as blade stall progresses, as will the requirement for forward force to maintain the cyclic in the initial trimmed position. Both of these cues should provide adequate warning that blade stall is being encountered. Severe turbulence or abrupt control movement at this point will increase the severity of the stall but will not cause any loss of control to occur. In this helicopter, there is not as pronounced a tendency for the fuselage to pitch up and roll left in response to the rotor stalling as may be experienced in other helicopters, but if the rotor is held in a stalled condition and the blade stall is aggravated, the helicopter will eventually exhibit this pitch and roll tendency. Even though blade stall may be encountered, the helicopter is fully controllable even in severe blade stall because of the blade design and the high rotor control power inherent in this rotor design. Blade stall may be eliminated by any or all of the following actions:

a. Gradually decrease the severity of the maneuver.

b. Gradually decrease collective pitch.

c. Gradually decrease airspeed.

9-3. Vortex Ring State (Settling With Power)

CAUTION

Flight conditions causing Vortex Ring State should be avoided at low altitudes because of the loss of altitude necessary for recovery.

1. Vortex Ring State may occur when a helicopter is flown below translational lift with more than 20% power applied and a descent rate over 300 feet per minute. Under this condition, the helicopter is descending through the air displaced by its own rotor system. The downwash then recirculates through the helicopter rotor system and results in reduced rotor efficiency. This condition can be recognized by increased roughness accompanied by a rapid build-up in rate of descent. Increasing collective pitch alone only tends to aggravate the situation. The Vuichard technique is very effective at recovering from settling with power. This technique uses the tail rotor thrust and the cyclic to move the advancing blade into clear air, at which point the vortex ring will dissipate. Recovery can be completed with much less altitude loss than with traditional techniques.

2. The Vuichard technique can be performed as follows: Simultaneously, apply sufficient right cyclic to cause a 10° to 20° bank, apply left pedal to maintain heading, and increase collective.

3. During approach for landings at high gross weights, conditions associated with Vortex Ring State should be avoided.

9-4. Loss of Tail Rotor Effectiveness

1. Loss of tail rotor effectiveness (LTE) is a phenomenon which can occur in any single main rotor/anti-torque tail rotor helicopter. Although the 280FX has a very effective tail rotor and does not exhibit any tendencies for LTE, the pilot should be aware that the potential for LTE, however small, does exist. As such, pilots should be aware of the causes and recovery techniques. There are a number of factors which reduce the effectiveness of the tail rotor or increase the thrust required from the tail rotor. These factors include high power settings, low airspeeds, low rotor RPM, left crosswinds or tailwinds, and right, yawing turns. Under exactly the right conditions, these factors can combine to make the tail rotor virtually ineffective. This LTE can be recognized by an uncommanded right yaw which cannot be stopped using the tail rotor pedal alone. Recovery from LTE can be accomplished by increasing forward speed, lowering the collective if altitude permits, and applying left pedal. The longer corrective actions are delayed, the more difficult it will be to recover from LTE.

9-5. Ground Resonance

1. Ground resonance is an aerodynamic phenomenon associated with fully articulated rotor systems. It develops when the rotor blades move out of phase with each other and cause the rotor disc to become unbalanced. The chance of encountering ground resonance in the 280FX is very remote; however, the potential does exist if the main rotor dampers or oleo struts are severely degraded or damaged.

2. If severe vibrations are encountered on the ground when bringing the main rotor rpm up to operating speed, immediately turn the throttle to the flight idle position. If severe vibrations are encountered when the main rotor rpm is at operating speed, immediately hover the aircraft and allow the vibrations to dampen. Attempt to land the aircraft. If severe vibrations are encountered again, immediately hover the aircraft, allow the vibrations to dampen, and perform a hovering autorotation.

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ENGINE EXHAUST MUFFLER

SECTION I. GENERAL

10-12-1. Introduction

This supplement must be attached to the Basic Rotorcraft Flight Manual when the aircraft is equipped with Wall-Colmonoy P/N ENX-0001 or an Enstrom P/N 28-12577-1 muffler. Operation in compliance with the Basic Rotorcraft Flight Manual is mandatory except as modified by this supplement. Other approved sections and supplemental data are recommended procedures.

10-12-2. Description

The muffler is installed in place of the standard exhaust tailpipe. No further modification to the aircraft is necessary. The muffler is one pound heavier than the tailpipe which it replaces.

SECTION II. OPERATING LIMITATIONS

Same as Basic Rotorcraft Flight Manual.

SECTION III. EMERGENCY AND MALFUNCTION PROCEDURES

Same as Basic Rotorcraft Flight Manual.

SECTION IV. NORMAL PROCEDURES

Same as Basic Rotorcraft Flight Manual.

SECTION V. PERFORMANCE

The slight increase in exhaust back pressure at high power settings reduces the engine power output such that the maximum hover weight must be reduced 60 pounds from that shown in Figures 5-3 and 5-4. The engine limits remain at 39.0 inches-Hg MP and 3050 RPM.

SECTION VI. WEIGHT AND BALANCE

Same as Basic Rotorcraft Flight Manual.

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