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**ENSTROM 280F OPERATOR'S MANUAL**

**AND**

**FAA APPROVED ROTORCRAFT FLIGHT MANUAL**

REPORT NO. 28-AC-019

Revision 9, dated Sep 12, 2024, applies to the Enstrom 280F Operator's and FAA Approved Rotorcraft Flight Manual. Incorporate this revision by removing and inserting the pages listed below.

| Remove pages | Insert pages |
|---|---|
| i through ii | i through ii |
| vii through viii | vii through ix |
| 4.1 through 4.10 | 4.1 through 4.10 |
| 6.6 | 6.6 |
| 6.8 | 6.8 |
| 8.8 through 8.9 | 8.8 through 8.9 |
| 8.11 through 8.15 | 8.11 through 8.16 |
| 9.0 | 9.0 through 9.3 |
| 10.12.1 | 10.12.1 |

** End **

# TABLE OF CONTENTS
# AND
# LIST OF EFFECTIVE PAGES

LOG OF PAGES AND REVISIONS

| REV NO | FAA APPROVAL | SUMMARY DESCRIPTION |
|---|---|---|
| 9 | | General updates, corrections, and clarifications<br>(i, ii, vii thru ix, 4.1 thru 4.10, 6.6, 6.8, 8.8, 8.9, 8.11 thru 8.16, 9.0 thru 9.3, 10.12.1) |
| | RYAN B NELSON Digitally signed by RYAN B NELSON Date: 2024.10.18 14:30:23 -05'00' FTP, AIR-712, *for*<br>Manager, Flight Test &<br>Human Factors Branch, AIR-710<br>Federal Aviation Administration | 18 Oct 2024<br>Approved<br>Date |

# 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 | Sep 28/03 | Article 3, Commission Regulation (EU) 748/2012 |
| 6 | Sep 28/03 | Article 3, Commission Regulation (EU) 748/2012 |
| 7 | Aug 17/15 | FAA/EASA T.I.P.; FAA Approved on Behalf of EASA by G. Michalik* |
| 8 | Aug 16/17 | FAA/EASA T.I.P.; FAA Approved on Behalf of EASA by W. Jaconetti♦ |
| 9 | 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. 7 dated October 19, 2023, Sections 3.3 and 3.5.12.4

# EASA LOG OF SUPPLEMENTS

| SUP. NO | DESCRIPTION | DATE | EASA APPROVED | FAA APPROVAL ON BEHALF OF EASA |
|---|---|---|---|---|
| 1 | Wet/Dry Dispersal System | Sep 28/03 | Article 3, Commission Regulation (EU) 748/2012 | N/A |
| 2 | Float Landing Gear | Sep 28/03 | Article 3, Commission Regulation (EU) 748/2012 | N/A |
| 3 | External Loads | Sep 28/03 | Article 3, Commission Regulation (EU) 748/2012 | N/A |
| 4 | Snowshoe | Sep 28/03 | Article 3, Commission Regulation (EU) 748/2012 | N/A |
| 5 | [Reserved] | | | |
| 6 | Right Side Pilot Configuration | NOT EASA APPROVED | | |
| 7 | [Reserved] | | | |
| 8 | Emergency Float Landing Gear | Sep 28/03 | Article 3, Commission Regulation (EU) 748/2012 | N/A |
| 9 | [Reserved] | | | |
| 10 | [Reserved] | | | |
| 11 | Auxiliary Fuel Tank | Sep 28/03 | Article 3, Commission Regulation (EU) 748/2012 | N/A |
| 12 | Engine Exhaust Muffler | Sep 28/03 | Article 3, Commission Regulation (EU) 748/2012 | N/A |

# SECTION 4 – NORMAL PROCEDURES

## I. PREFLIGHT PLANNING

A. Review and be familiar with Section 2, "Operating Limitations."

B. Calculate weight and balance and review loading information in Section 6, "Weight and Balance."

C. Obtain weather briefing and file flight plan.

D. Refer to Section 5, "Performance," to determine if helicopter is within limitations for planned loads, winds, temperature and pressure altitudes.

**NOTE:** Pilot experience and training is another factor to consider prior to conducting certain flights, even if helicopter is within its operating envelope.

E. Check helicopter and engine log books to determine if helicopter is airworthy.

## II. PREFLIGHT INSPECTION

The following checklists are designed to be used as a guide while performing the preflight inspection. Thoroughly familiarize yourself with the Maintenance Manual before utilizing this checklist.

A. Before Preflight Inspection

1. Aircraft tie-downs and covers – Removed and stowed.
2. Publications – Check the cabin for the following items:
   a. Standard Airworthiness Certificate, FAA Form 8100-2.
   b. Certificate of Aircraft Registration, AC Form 8050-3.
   c. Aircraft Radio Stations License FCC Form 556 (if required).

   **NOTE:** An Aircraft Radio Station License may not be required for the aircraft. Refer to FCC WT Docket No. 96-82 for more information.

   d. 280F Operator's Manual.
   e. Weight and balance forms (Figures 6.8 through 6.11) for helicopter to be flown. The serial number of the helicopter to be flown should appear on these forms.

   **NOTE:** The above items are to be carried in the helicopter at all times. Owners and operators of exported helicopters should check with their own Aviation Officials to determine documents required.

3. Master switch – ON.
4. Fuel quantity – check.

5. Lights – ON then OFF after check. Check landing, anti-collision, position, and interior lights for condition and security.
6. Master switch – OFF.
7. Ignition switch – OFF.
8. All other switches – OFF.
9. Fuel valve – ON.
10. Right side flight controls – check security if installed. Check if properly stowed if removed.
11. Pedals – adjust as required.
12. Fire extinguisher – check for charge, condition, and security.

B. Preflight Inspection – Fuel Management

1. Left fuel tank drain – Drain sample into jar. Verify the fuel grade, check the cleanliness, and check that fuel is free of water.

**WARNING: Sample the left and right fuel tank sumps before checking the fuel filter.**

**NOTE:** Aircraft should be level or slightly nose down. Rock the aircraft by moving the tail up and down to displace any water or contaminants to the tank sumps. If water is found, rock the aircraft and re-sample. Check the other tank. Repeat until no water is found. Then check the fuel filter.

2. Right fuel tank drain – Drain sample into jar. Verify the fuel grade, check the cleanliness, and check that fuel is free of water.
3. Fuel filter – Secure and drain fuel sample into jar. Verify the fuel grade, check the cleanliness, and check that fuel is free of water.

C. Preflight Inspection – Exterior

1. Left door – check condition, security and latch operation.
2. Windshield – check condition.
3. Pitot tube – unobstructed.
4. Landing light – check condition.
5. Right door – check condition, security and latch operation.
6. Right oleo struts – check extension and security.
7. Right landing gear – check condition and security. Check ground handling wheel in up position and secured.

8. Right side engine compartment:
   a. Electrical wiring – condition and terminals tight.
   b. Induction system – no obstructions, filter secure, induction hose and lines secure and backfire and alternate air doors free.
   c. Fuel filter – secure.
   d. Fuel lines – secure.
   e. Oil lines – secure and no sign of leakage.
   f. Exhaust – no cracks or signs of leakage.
   g. Cowl door – secure.
9. Upper inspection door:
   a. Swashplate and control rods – check condition and security.
   b. Fuel tank and lines – check for leaks and lines and fittings secure.
   c. Fire curtain – check condition.
10. Kick-in step door:
    a. Belt drive system – check security and condition of idler pulley, 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 – check for leaks, 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 not recommended.
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 of leading edge blade tape (if installed), 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. Open inspection door – check main rotor transmission sight gauge. Normal level is halfway mark on sight gauge.
    c. Door secured.
14. Right static port – check unobstructed.
15. Right tail cone – check condition.
16. Tail rotor drive shaft – condition and security of drive shaft, hangar bearings and flex couplings.
17. Right horizontal stabilizer – check condition and security.
18. Right position/anti-collision light – check security.
19. Tail rotor:
    a. Control cables – check condition 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 link mechanism – check condition and operation. Check pitch links for binding or looseness and check hardware for security.
    e. Tail rotor hub – check security. Check condition of teeter stop bumpers.
    f. Tail rotor blades – check security. Check for cracks or bond separations. Check strike tabs for evidence of strike.
    g. Position light – check condition and security.
20. Left horizontal stabilizer – check condition and security.
21. Left position/anti-collision light – check condition.
22. Left tail cone – check condition.
23. Left static port – unobstructed.
24. Inspection door:
    a. Belt drive system – engage manual clutch and check belt tensioning system for proper rigging. Disengage manual clutch.
    b. Cooling fan – check condition.

25. Left fuel tank – 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 not recommended.

26. Upper inspection door:

    a. Check engine oil quantity – 10 quarts full, 8 quarts minimum for flight.

    b. Swashplate and control rods – check condition and security.

    c. Fuel tank and lines – check for leaks, lines and fittings secure.

    d. Fire curtain – check condition.

27. Left engine compartment:

    a. Turbocharger – check condition and security. Check condition of thermal cover and check area around turbocharger for evidence of heat damage.

    b. Exhaust system and wastegate – check for security and evidence of leakage. Wastegate linkage should be in detent, throttle motion should be free and unrestricted with associated wastegate motion.

    c. Cowl door secure.

28. Left oleo struts – check extension and security.

29. Left landing gear – check condition and security. Ground handling wheel in up position and secured.

30. Main rotor blades – security and condition of leading edge blade tape (if installed), no bond separations, cracks or corrosion. Main rotor retention pins secured.

31. Check operation of all lights for night flight.

III. BEFORE STARTING ENGINE

A. Seat belts fastened and doors latched.

B. Heater as desired (in for OFF).

C. Check magnetic compass.

D. Altimeter set to field elevation.

E. Radio(s) OFF, frequencies set.

F. All switches OFF.

G. All circuit breakers set (pushed in).

H. Fuel valve ON (pushed in).

I. Flight controls – check for full travel. Center cyclic and pedals.

J. Collective full down and locked.

K. Set throttle friction so that slight effort is required to rotate the throttle.

L. Throttle OFF.

M. Rotor clutch disengaged.

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

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

IV. STARTING ENGINE

A. Master switch ON.

B. Starter relay CB ON

C. Ignition switch ON to BOTH

D. Throttle open (full).

E. Mixture control full rich.

F. 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.

G. Boost pump OFF.

H. Mixture control to idle cutoff (ICO).

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

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

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

J. 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 D through I.

K. Turn fuel boost pump ON.

L. Check engine oil pressure off “0” mark within 30 seconds.

M. Disconnect APU (if used).

N. Alternator ON.

O. 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.)

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

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

V. STARTING HOT OR FLOODED ENGINE

A. Hot engine

1. Prime engine 0-3 seconds.
2. Throttle back to start (i.e., index up).
3. Engage starter button. When engine fires, release starter button and push mixture control to full rich.
4. Proceed with normal starting procedure (para. IV, steps K-Q).

**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.

B. Flooded engine

1. Ignition switch in **OFF** position, throttle full open and mixture control in ICO.
2. Press starter and crank engine for 3-5 seconds.
3. Throttle closed, then open to start index up position. Ignition switch ON and proceed with normal starting sequence.

VI. ROTOR ENGAGEMENT

A. 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.

Collective friction is to be used for ground operation only.

B. Check pedals in neutral position.

C. Center cyclic with trim motors.

D. Check area for personnel and obstructions.

E. Maintain throttle in idle position 1450-1500 rpm and slowly engage clutch until engine rpm drops to 1100-1200 rpm.

F. When rotor rpm reaches 100 rpm, fully engage clutch.

**NOTE:** Clutch disengage warning light will go out when clutch is fully engaged.

G. Place clutch handle in stowed position.

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

VII. OPERATIONAL CHECKS

A. Advance throttle to 1800 rpm and wait for cylinder head temperature to reach 200°F.

B. After reaching 200°F cylinder head temperature, slowly advance throttle to 2300 rpm and wait until oil temperature reads 80°F.

C. Advance throttle to 3050 rpm.

D. Check manifold pressure 16-18 inches.

E. Check fuel flow 65-70 lb/hr (engine cold) (50-65 lb/hr engine warm).

1. Adjust the fuel flow as required to attain 50-70 lb/hr (as required) at full rpm (thus raising EGT and reducing manifold pressure).

F. Move ignition switch to LEFT position. Maximum 125 rpm drop allowable in 5 seconds and maximum of 100°F rise in EGT. Return switch to BOTH position and let rpm stabilize. Move switch to RIGHT position. Maximum 125 rpm drop and maximum 100°F EGT rise allowable. Return switch to BOTH position.

**NOTE:** Engine should not run rough when operating on one magneto.

G. Check engine driven fuel pump by turning off boost pump and checking for no change in engine operation. Observe green pressure light out and red fuel pressure light on. Return boost pump switch to ON position.

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

## VIII. BEFORE TAKEOFF

Check the following items for proper position or indication:

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

B. Fuel valve ON (in).

C. Ammeter.

D. Main rotor gearbox temperature.

E. Fuel quantity.

F. Cylinder head temperature.

G. Engine oil temperature.

H. Engine oil pressure.

I. Mixture control set for 50-70 lb/hr fuel flow (as required).

J. Boost pump ON and green light ON.

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

L. Clutch warning light – press to test – red light goes out when released.

M. Throttle friction.

N. Release collective lock.

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

IX. TAKEOFF TO HOVER

A. Cyclic in neutral position.

B. Set engine rpm to 2300 rpm with collective full down.

C. 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.

D. Check EGT 1450-1550°F.

1. If EGT is above 1550°F, land and richen the mixture slightly.

2. If EGT 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.

X. NORMAL TAKEOFF

A. Align helicopter with desired takeoff course at a stabilized hover height of approximately 2 ft.

B. Check power required to hover.

C. Smoothly apply forward cyclic to begin acceleration into effective translational lift.

D. 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.

E. When effective translational lift has been attained, adjust throttle as necessary to maintain RPM within the normal operating range. Establish a positive rate of climb. See Height-Velocity Diagram, Figure 5.5, for recommended takeoff profile.

XI. MAXIMUM PERFORMANCE TAKEOFF

A. Stabilize at 2 ft hover aligned with desired takeoff course. Check hover power.

B. Smoothly apply forward cyclic to begin acceleration into effective translational lift.

C. As the helicopter begins forward movement, increase collective pitch to maintain 2-5 ft skid height and 3050 RPM.

**CAUTION**: DO NOT exceed 39.0 inches of manifold pressure.

**NOTE:** Since the 280F is equipped with a full-time turbocharger, the turbocharged engine is equipped with an overboost warning light on the instrument panel to warn the pilot of an overboost condition. Transient overboost conditions, which may trigger the warning light, may not show as overboost conditions on the manifold pressure gauge. The manifold pressure gauge red line is the determining factor in ascertaining the magnitude of an overboost condition. Subject overboost conditions must be logged in the engine log and inspections performed per Lycoming Bulletin 592.

D. After attaining translational lift, adjust throttle as necessary to maintain rpm at 3050 RPM. Continue level acceleration to 35 mph, then apply aft cyclic to allow the helicopter to climb and accelerate to best rate of climb speed. Maintain constant airspeed. Climb at best climb speed to clear barrier.

XII. MAXIMUM PERFORMANCE TAKEOFF IN CONFINED AREA

[DELETED]

XIII. Cruise

A. Maintain 3050 RPM and 29 inches manifold pressure, or less, in level flight.

B. Set cyclic trim.

C. Lean fuel mixture to approximately 90 lb/hr at 29 inches manifold pressure.

D. Monitor EGT.

**NOTE:** Allow a few minutes for temperature to stabilize. DO NOT exceed 1650°F EGT. Make fine adjustments to attain desired fuel flow and cross check cylinder head temperature and oil temperature. If temperatures are too high, enrich mixture in 25°F increments until temperatures remain in green arc.

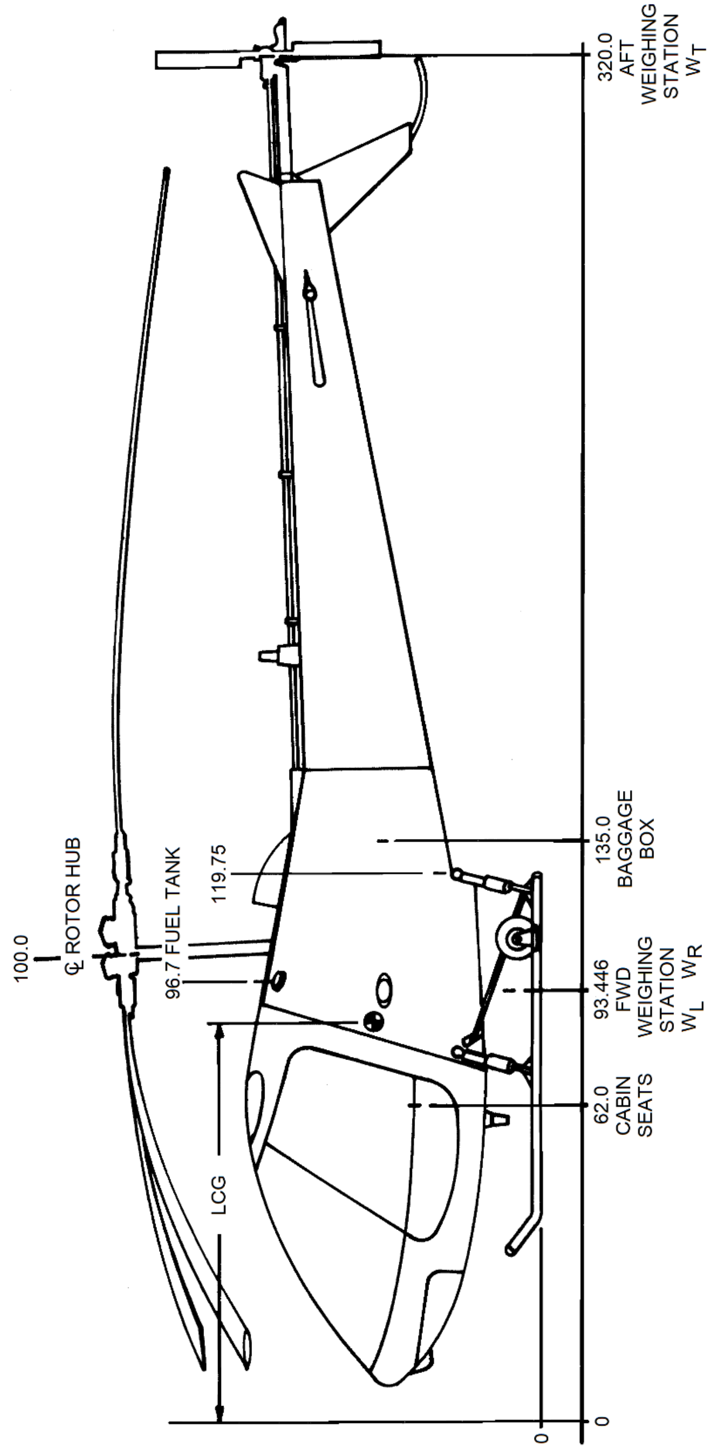

320.0
AFT
WEIGHING
STATION
$W_T$
135.0
BAGGAGE
BOX
93.446
FWD
WEIGHING
STATION
$W_L$ $W_R$
62.0
CABIN
SEATS
100.0
℄ ROTOR HUB
96.7 FUEL TANK
119.75
LCG
0
0

Figure 6.4

B. Sample Calculation – Longitudinal C.G.

| SAMPLE LOADING | SAMPLE HELICOPTER Arm (in) | Weight (lb) | Moment (1000 in-lb) | HELICOPTER S/N_______ Weight (lb) | Moment (1000 in-lb) |
|---|---|---|---|---|---|
| 1. Basic empty weight from Form F-165A | 100.7 | 1610.0 | 162.1 | | |
| 2. Pilot and passengers Cabin seats | 62.0 | 480.0 | 29.8 (1) | | |
| 3. Baggage compartment load | 135.0 | 20.0 | 2.7 (1) | | |
| 4. 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 | | |
| 5. Usable fuel | 96.7 | 240.0 | 23.2 (1) | | |
| 6. 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 6.5.

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

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

$$\text{c.g. zero fuel} = \frac{217{,}600 \text{ in-lb}}{2350 \text{ lb}} = 92.6 \text{ in}$$

The total weight and moment can also be plotted on Figure 6.6 to determine if the loading is within longitudinal limits.

(3) Maximum gross weight is 2600 lb.

1. Servicing – Over-Running Clutch

The clutch area should be looked at frequently to determine if any leaks exist. When a service check is required, proceed as follows:

a. Turn clutch until two screws are horizontal and the third screw is above.

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

c. Add oil through top hole. 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.

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

Formsprag Clutch Oil/Synthetic Lubrication Specifications:

-40°F to +120°F – MIL-PRF-7808

-40°F to +120°F – MIL-PRF-23699

F. Tail Rotor Transmission

The tail rotor transmission is located on the aft end of the tail cone extension tube. It transfers power from the 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. Approved oils for servicing the tail rotor transmission are as follows:

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

1. Draining – Tail Rotor Transmission

There is a drain plug located on the bottom of the transmission and a filler plug located just above the sight gauge.

a. Remove safety wire and filler plug.

b. Using a suitable container, remove drain plug, allowing oil to drain completely.

c. Inspect magnetic plug for metal particles.

d. Remove and replace crush washer on magnetic plug.

e. Inspect condition of O-ring of filler plug. Replace if necessary.

2. Servicing – Tail Rotor Transmission

a. Install magnetic drain plug.

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

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

d. Safety wire the filler plug, magnetic plug, and sight gauge with 0.032” safety wire.

e. Visually check for oil leaks.

f. Wipe dry any oil spillage using a clean cloth.

G. 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.

H. 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:

1. Check for proper inflation by observing piston position in strut. From ¾ inch to 1¾ inches of the chrome piston should be visible. When protective boots have been installed, measure from upper flange of piston assembly to the brass collar on seal housing. Satisfactory length is 3½ to 4½ inches.

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

2. 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 6.8).

3. Servicing

   a. Check the tire pressure, 70 to 75 psi.

   b. Lubricate axle shaft with general purpose grease.

   c. Lubricate wheel bearings with wheel bearing grease.

J. 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. Clean with fresh water and a mild detergent soap.

**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.

K. Autorotation RPM Check

1. 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.

2. Autorotation RPM Check

   a. The autorotation rpm should be checked to comply with the schedules shown in Figures 8.1 and 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.

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 during this test 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).

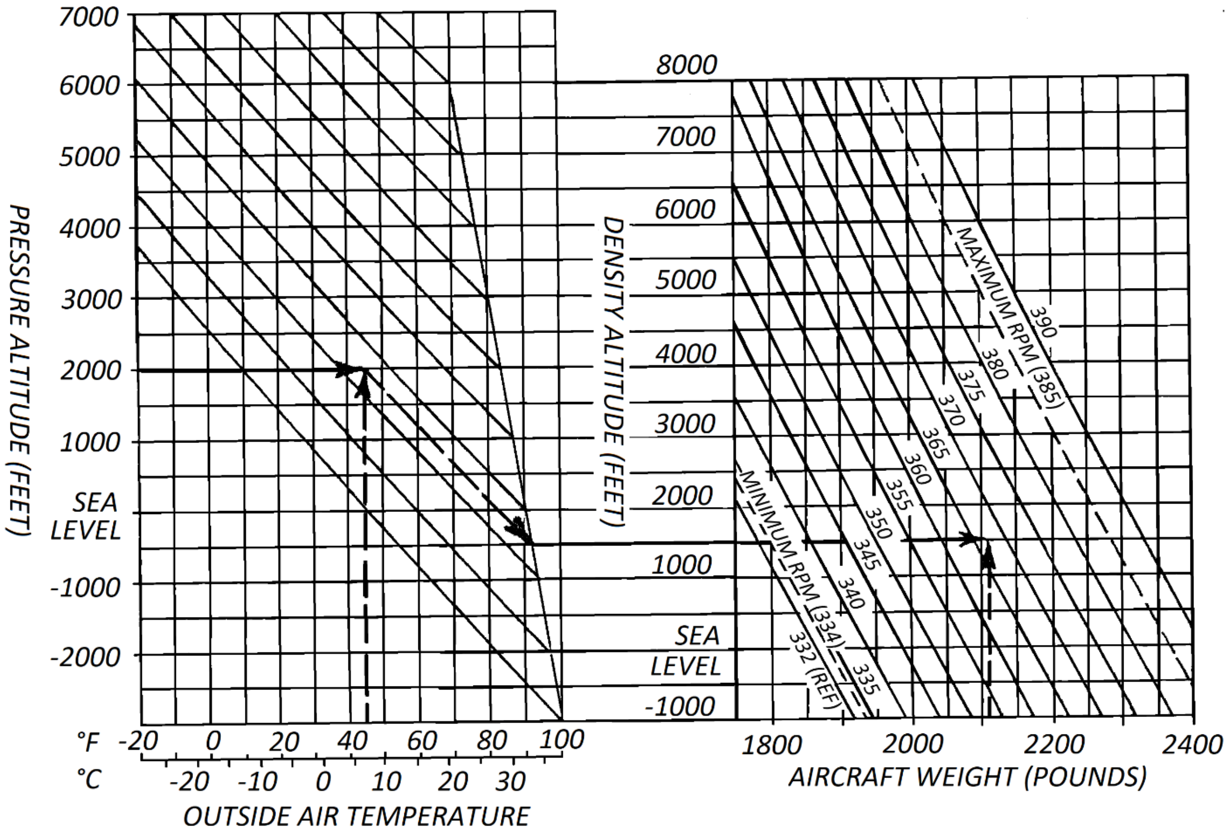
5) Establish the helicopter in a stabilized autorotation at 60 MPH with the collective full down. Do not allow the rotor RPM to exceed 385 rpm or to fall below 334 rpm.

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.

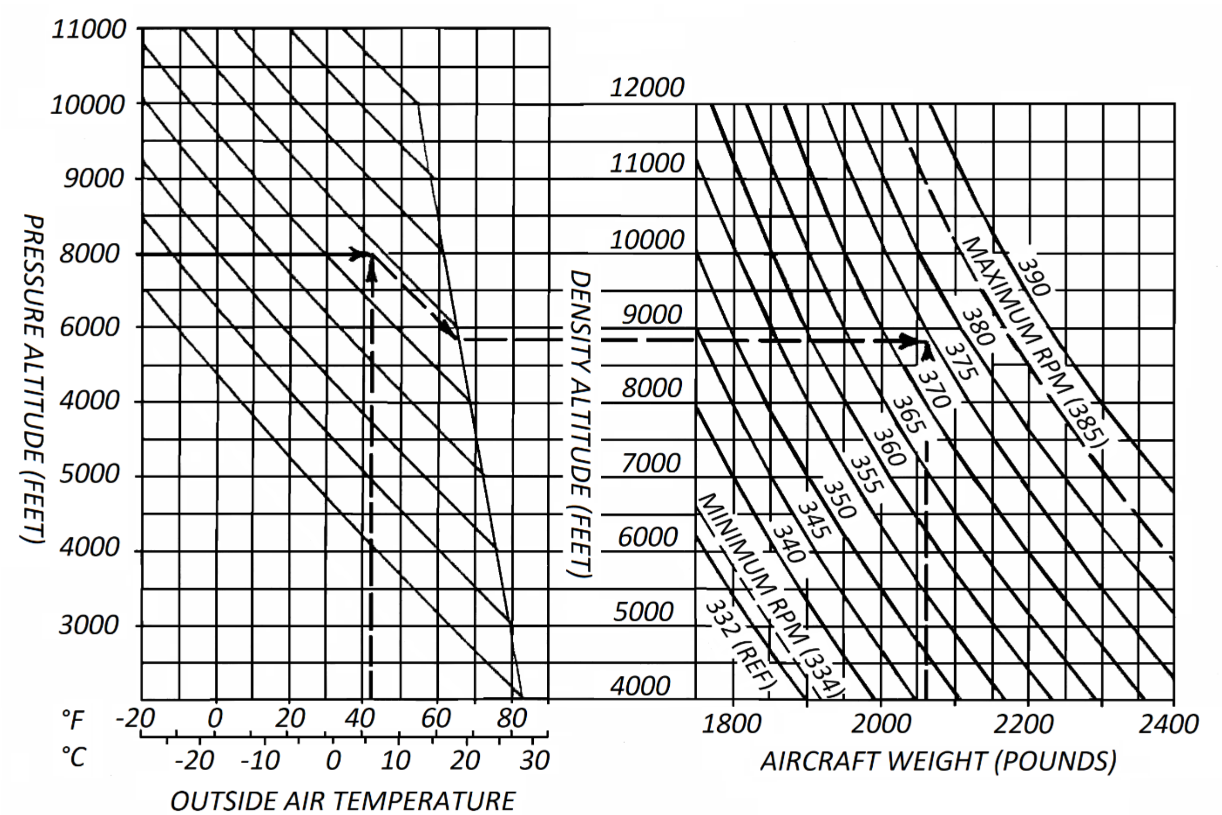



Example:

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 8.1 – Autorotation RPM Schedule for Sea Level 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.

Figure 8.2 – Autorotation RPM Schedule for 6000 Foot Level Base Altitude

L. 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.

M. 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 6.8).

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.

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

N. 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 controls will change the helicopter weight and c.g. and shall be recorded on the Weight and Balance form (Figure 6.8).

O. 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.

1. Operate the helicopter to normal temperature and pressure ranges.
2. Verify the magneto operation.
   a. Maximum engine drop: 125 rpm
   b. Maximum TIT rise: 100 °F
3. Perform normal cool down.
   a. 1 minute at 2000 engine rpm
   b. 2 minutes with throttle off and clutch disengaged
4. Verify idle is between 1450-1500 rpm.
5. Maintain boost pump ON.
6. Slowly lean the engine and observe engine rpm.

   **NOTE:** Move mixture to full rich before the engine quits.

   a. If the rpm rises during leaning – idle mixture is rich.
   b. If the rpm drops immediately – idle mixture is lean.
7. Engage clutch:
   a. Accelerate engine to 2500 RPM.
   b. If engine stumbles during acceleration, the idle mixture is too lean.
8. If the preceding idle mixture operational check is unsatisfactory, maintenance action is required before flight.

# SECTION 9

# OPERATIONAL INFORMATION

# I. GENERAL OPERATION

## A. Slope Landings

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.

## B. Bird Strike

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.

## C. 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 V, Sub-paragraph K for performing an autorotation RPM check.
2. For changes in base altitude, the idle mixture should be checked and readjusted as necessary. Refer to Section 8, Paragraph V, Sub-paragraph O for performing an idle mixture operational check.

# II. FLIGHT CHARACTERISTICS

## A. Retreating Blade Stall

1. Retreating 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.

B. Vortex Ring State (Settling With Power)

**<u>CAUTION</u>**: 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.

C. 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 F-28F 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 accomplishedby 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.

D. 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 F-28F 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.

SUPPLEMENT NO. 12

ENGINE EXHAUST MUFFLER

## SECTION 1 - GENERAL

I. INTRODUCTION

This supplement must be attached to the basic flight manual when the aircraft is equipped with a 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.

II. 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 2 – OPERATING LIMITATIONS

No change from the basic flight manual.

## SECTION 3 – EMERGENCY AND MALFUNCTION PROCEDURES

No change from the basic flight manual.

## SECTION 4 – NORMAL PROCEDURES

No change from the basic flight manual.

## SECTION 5 – 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 6 – WEIGHT AND BALANCE

No change from the basic flight manual.