ENSTROM 280FX OPERATOR'S MANUAL

AND

FAA APPROVED ROTORCRAFT FLIGHT MANUAL

REPORT NO. 28-AC-020

Revision 12, dated December 3, 2018, applies to the Enstrom 280FX 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 viii
2-7 through 2-8	2-7 through 2-8
4-3 through 4-4	4-3 through 4-4
4-7 through 4-14	4-7 through 4-14
6-9 through 6-10	6-9 through 6-10
7-11 through 7-16	7-11 through 7-16

.....Nothing Follows.....

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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 1 2 2019	for: D. Barbini

FAA Approved by
Manager, Southwest Flight Test Section, AIR-713
Federal Aviation Administration
Ft. Worth, TX

NOTE

All revisions are indicated by a black vertical line.

EASA LOG OF REVISIONS

Rev. No.	Date	EASA Approved	FAA Approval on Behalf of EASA
1	Sep 28/03	Article 3, Commission Regulation (EU) 748/2012	N/A
2	Sep 28/03	Article 3, Commission Regulation (EU) 748/2012	N/A
3	Sep 28/03	Article 3, Commission Regulation (EU) 748/2012	N/A
4	Sep 28/03	Article 3, Commission Regulation (EU) 748/2012	N/A
5	Jul 4/14	EASA 10049746	N/A
6	Jun 9/15	EASA 10053596	N/A
7	Jul 9/15	FAA/EASA T.I.P*	G. J. Michalik
8	Jun 9/15	EASA 10053594	N/A
9	Jul 9/15	FAA/EASA T.I.P*	G. J. Michalik
10	Feb 13/17	FAA/EASA T.I.P*	G. J. Michalik
11	Apr 5/18	FAA/EASA T.I.P*	M. Runyan

* Section 3.2 T.I.P.

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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. EGT/TIT		1650°F maximum	
NOTE **The maximum limit for the turbocharger turbine inlet temperature (TIT) is 1650°F. This limit was previously referred to as EGT (exhaust gas temperature).**			
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.

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

SECTION 4. NORMAL PROCEDURES

4-1. Preflight Planning

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

2. Calculate weight and balance and review loading information in Section 6, "Weight/Balance and Loading".

3. Obtain weather briefing and file flight plan.

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

NOTE

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

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

4-2. Preflight Inspection - General

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 the checklists.

4-3. 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 Station 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. 280FX Operator's Manual.

e. Weight and balance forms (Figures 6-7 through 6-9) for the 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 U.S. registered helicopter at all times. Owners and operators of exported helicopters should check with their own National Aviation Authority (NAA) 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. Annunciator panel – press to test – all lights should be on when button (TEST) is pushed.

7. Master switch – OFF.

8. Ignition switch – OFF.

9. All other switches – OFF.

10. Fuel valve – ON.

11. Right side flight controls – check security if installed. Check if properly stowed if removed.

12. Pedals – adjust as required.

13. Fire extinguisher – check for charge, condition, and security.

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. 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.

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.

21. Left horizontal stabilizer – check condition and security.

22. Left vertical stabilizer – check condition and security.

23. Left position and anti-collision lights – check security.

24. Left tail cone – check condition.

25. Driveshaft cover – check security and condition.

26. Left static port – unobstructed.

27. 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.

28. Left 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>

29. Upper inspection door

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

NOTE

Total oil capacity for the engine oil system (including oil lines and coolers) is 10 quarts. The engine oil sump capacity is 8 quarts. The engine oil dip stick is marked to correspond with the engine oil sump capacity of 8 quarts (full) and 6 quarts (low).

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

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

d. Fire curtain – check condition.

30. Left engine compartment

WARNING

To prevent injury, use caution near exhaust system components if the helicopter has been operated within the last few hours.

a. Tailpipe – (first flight of the day) check for security to the turbocharger. Firmly grasp the end of the tailpipe and attempt to displace it. The tailpipe must not be loose.

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

c. 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.

d. Cowl door secure.

31. Left oleo struts – check extension and security (reference step 6 above).

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

33. Main rotor blades – check condition of bonds,

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

3. Throttle – OFF.

4. 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.

5. Collective full down and locked.

6. Fuel valve ON (in).

7. Heater as desired (in for OFF).

8. Rotor clutch disengaged.

CAUTION

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

9. Mixture control in idle cutoff position.

10. Check magnetic compass.

11. Altimeter set to field elevation.

12. Radio(s) OFF.

13. All switches off and circuit breakers set.

4-7. Starting Engine

NOTE

If a headset is in use, it is recommended to remove the headset during this sequence to be able to hear the engine.

1. Collective down and locked.
2. Master switch ON.
3. Annunciator panel – press to test – all lights should be on when button is pushed.
4. Alternator switch ON (OFF for APU start).
5. Starter relay switch/CB ON.
6. Trim motor switch ON or CB IN.
7. Throttle open (full).
8. Mixture control full rich.
9. 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.

10. Boost pump OFF.
11. Mixture control to idle cutoff (ICO).
12. 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.

13. Ignition switch ON to BOTH.

14. 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 6-11.

15. Turn fuel boost pump ON.

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

17. Disconnect APU.

18. Alternator ON.

19. 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.)

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

21. 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. Proceed with normal starting procedure (para. 4-7, steps 1-5).

   b. Prime engine 0-3 seconds.

   c. Proceed with normal starting procedure (para. 4-7, steps 10-13).

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, steps 10-13).

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.

6-4. Door C.G. and Weight

1. If one or both doors are removed for operation, calculate the weight and balance taking into account the following information:

   a. S/N 2166 and prior:

		Longitudinal		Lateral	
	Weight (lb)	Arm (in)	Moment (1000 in-lb)	Arm (in)	Moment (in-lb)
a. Right door	10.2	59.8	0.61	29.25	298
b. Left door	10.2	59.8	0.61	-29.25	-298
c. Both doors	20.4	59.8	1.22	0	0

   b. S/N 2167 and subsequent:

		Longitudinal		Lateral	
	Weight (lb)	Arm (in)	Moment (1000 in-lb)	Arm (in)	Moment (in-lb)
a. Right door	9.03	59.8	0.54	29.25	264
b. Left door	9.03	59.8	0.54	-29.25	-264
c. Both doors	18.1	59.8	1.08	0	0

2. Removal or installation of the door(s) will change the helicopter weight and c.g. Subtract the weight and moment of the door(s) when removing them and add the weight and moment when reinstalling. These changes shall be recorded on the Weight and Balance form (Figure 6-7) by a licensed mechanic to maintain the running basic total weight, arm, and moment, or the pilot can account for the door weight and c.g. changes in the individual weight and balance for that flight as he would for any other loose equipment.

6-5. Copilot Flight Controls C.G. and Weight

1. Refer to SIL 0179 for weight and balance information.

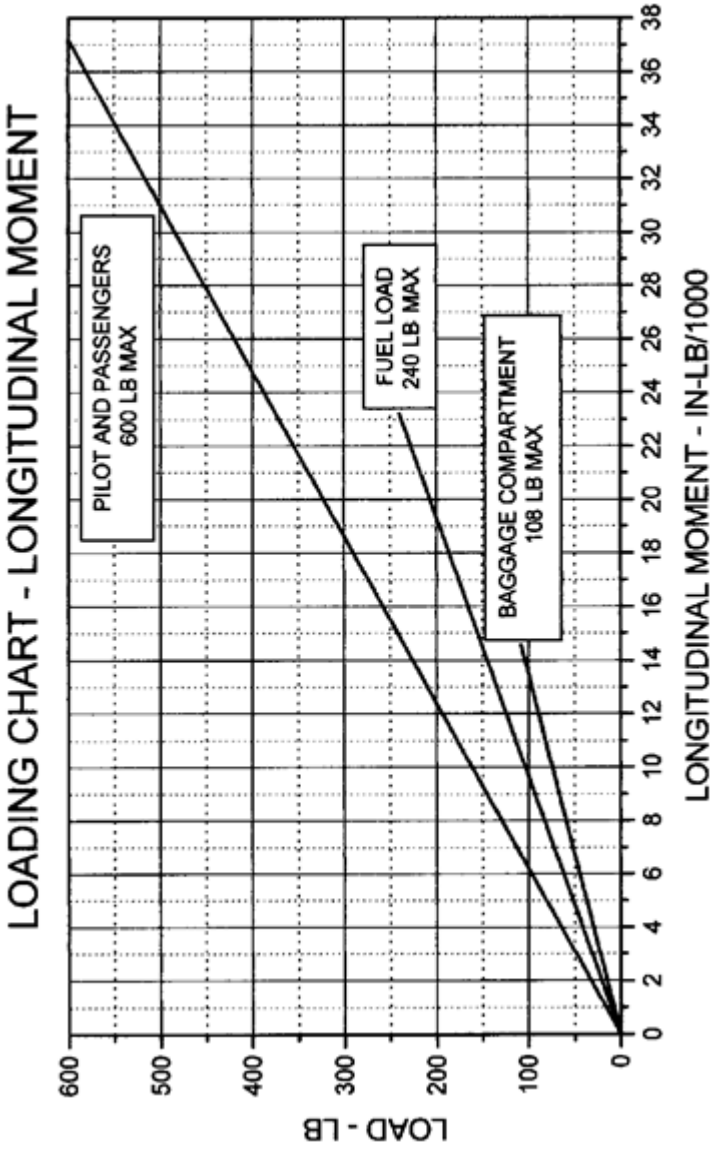

Figure 6-4. Loading Chart

Leading edge tape, as supplied by the Enstrom Customer Service Department, can be installed on the leading edge of the main rotor blades. If the tape is installed, it must be inspected prior to each flight. Look for blisters, bubbles, holes, or separation from the blade. If any defects are found, it must be removed, repaired, or replaced before further flight. If the helicopter is operated in rain, the tape life may be shortened considerably. Separation of part or all of the blade tape can cause an extremely rough rotor system. In this event, the helicopter should be landed as soon as practical and the rotor system, blades and tape inspected prior to further flight.

2. Tail Rotor

   The tail anti-torque rotor counteracts the torque of the main rotor and functions to maintain or change the helicopter heading. The tail rotor is a two-bladed, teetering, delta-hinge type assembly.

3. Rotor Tachometer

   The rotor RPM indicator is part of a dual-purpose tachometer that also reads engine RPM.

7-11. Flight Controls

1. Cyclic Control

   The cyclic control stick is a curved tube extending from the floor up between the legs of the pilot. The direction of stick movement results in a change of the plane of rotation of the main rotor and will produce a corresponding directional movement of the helicopter through the longitudinal and lateral modes of flight. The stick grip incorporates a trigger-type switch used for radio transmissions and intercom; a trim switch located on the top of the cyclic stick grip to control the longitudinal and lateral stick forces; and a push-button switch configured for an avionics or equipment installation option. Prior to S/N 2167, this switch is configured to turn the forward landing light on and off.

NOTE

The forward landing light switch/circuit breaker in the panel, installed in early production 280FX helicopters, must be ON for the cyclic push-button switch to function.

2. Collective Pitch Control

The collective pitch control lever is located to the left of the pilot's position and controls the pitch of the blades. A rotating, grip-type throttle is located at the end of the collective control. For S/N 2167 and subsequent, the collective control includes an illuminated switch box mounted forward of the throttle. Both the pilot and co-pilot collective switch boxes incorporate a starter button, forward landing light switch, and an aft landing light switch. The co-pilot's collective is removable.

3. Directional Control Pedals

The directional control pedals are located in the cabin forward of the pilot and/or co-pilot. When moved, these adjustable pedals change the pitch of the tail rotor blades and thereby provide the method of changing directional heading.

NOTE

The copilot flight controls may be removed to accommodate passengers or cargo. Refer to SIL 0179 for removal and installation instructions.

4. Stabilizer

A fixed position stabilizer is installed on the tail cone assembly for longitudinal stability. This stabilizer has two large vertical fins that provide directional stability. These endplates are constructed of fiberglass over structural foam cores.

7-12. Flight Instruments

The standard flight instruments that are installed in the 280FX as basic equipment comply with the requirements under visual flight rules for day or night operation. The panel arrangement provides ease of visual observance and includes space provisions for installation of additional instruments to meet individual requirements.

1. Airspeed Indicator

   The single-scale airspeed indicator is calibrated in MPH and provides an indicated airspeed reading during forward flight. Later production aircraft are equipped with a dual-scale indicator (MPH/KNOTS). The pitot tube, which provides the air pressure source, is located below the cabin nose section. Static air pressure for instrument operation is derived from two static vents located on either side of the tail cone assembly. The openings in the pitot tube and static vent ports must be free of obstructions and clean at all times for proper instrument operation.

2. Altimeter

   The altimeter is a sensitive type that provides height readings from 0 to 25,000 ft. The long hand, in a single complete sweep of the dial, totals 1,000 ft, and the short hand totals thousands of feet altitude. The instrument is vented to the same static port vents as the airspeed indicator.

3. Compass

   A standard aircraft quality magnetic compass is mounted to the center windshield post within easy sight of pilot or co-pilot.

4. Outside Air Temperature Indicator

   The OAT indicator provides ambient temperature information, which, when utilized, will assist in determining performance capabilities of the helicopter at the existing climatic condition. OAT indication is shown

by the 4-digit numeric display on the GEM 610 or the 9-segment alphanumeric display on the EDM 700. Refer to the applicable engine monitor pilot's guide for accessing the OAT parameter display. S/N 2146 and prior helicopters are also equipped with a direct reading OAT instrument located in the top of the cabin.

7-13. Electrical Power Supply System

1. Direct Current Power System

   The basic power supply system is either a 12-volt or a 28-volt direct current system, with a negative ground to the helicopter structure. A belt-driven 70-amp alternator is located on the aft part of the engine. On early production helicopters with a 12-volt system, the 12-volt battery is located in the right-hand side of the pilot's compartment and serves as a stand-by power source to supply power to the system when the alternator is inoperative. If the helicopter has a 28-volt system or is a later production helicopter with a 12-volt system, the 24-volt or 12-volt battery is located above the right side of the aft landing gear cross tube.

2. Electrical Power Panel

   The following switches/combination circuit breakers are located on the switch circuit breaker panel mounted on the instrument console within easy reach of pilot or co-pilot: magneto key switch, master switch, alternator switch and alternator circuit breaker, boost pump switch, navigation position lights switch, anti-collision light switch, panel lights, aft landing light (prior to S/N 2166), avionics master (if equipped), and trim motor switch.

   On later production aircraft, the trim motor switch/circuit breaker is replaced with a pull-type circuit breaker. The upper portion of the electrical panel in the instrument console contains the switches/circuit breakers for the lighting equipment.

7-14. Lighting Equipment

The helicopter lighting kit includes the required lights necessary for VFR night operation plus additional lighting equipment for utility and convenience purposes.

1. Position Lights

   The position lights are located on either side of the vertical stabilizers. Each light assembly contains either a red or green light, as appropriate, and a white tail position light.

2. Anti-Collision Lights

   The anti-collision lights have a flashing action that provides for adequate identification of the helicopter. They are operated by the anti-collision switch/circuit breaker located on the panel. The lights are located on the vertical stabilizers.

3. Landing Lights

   The helicopter is equipped with two landing lights, a forward landing light in the nose and an aft landing light on the belly below the engine. On early production helicopters, both lights are turned on by circuit breaker-type switches on the instrument panel. For helicopters manufactured through S/N 2166, the forward landing light is controlled by push button switch located on the pilot's cyclic. The aft landing light is controlled by the panel switch LDG LT AFT. For S/N 2167 and subsequent, the forward and aft landing lights are controlled by the FWD LDG LT and AFT LDG LT switches located on the collective switch box. The forward landing light switch also has a setting for pulse.

NOTE

For S/N 2166 and prior, the panel switch must be on for the aft landing light to operate. On early production helicopters, both panel switches must be on.

7-15. Landing Gear System

1. Skid Landing Gear

   The main landing gear consists of two tubular aluminum skids attached to the airframe by means of the forward

and aft cross tubes through four pivoting legs and four nitrogen-oil oleo struts. The struts prevent ground resonance as well as cushion ground contact during landing. Drag struts give the gear stability and strength and prevent fore and aft movement during ground contact maneuvers. Replaceable hardened steel skid shoes are installed on each skid to resist skid wear on hard surfaces.

2. Tail Rotor Guard

A tubular tail rotor guard is installed on the aft end of the tailcone. It acts as a warning to the pilot upon an inadvertent tail-low landing and aids in protecting the tail rotor from damage.

3. Ground Handling Wheels

Each landing gear skid tube has a manually operated overcentering device to lower the wheels or retract them for flight. The ground handling wheels should be retracted and the helicopter allowed to rest on the skids when engine run-up is being performed or when the helicopter is parked. If the aircraft has optional removable Brackett® wheels, they should be removed before the engine is run-up. The wheels and brackets can be removed for flight, or they can be secured in the up position. The wheels weigh 13 pounds and are attached to the skids at station 104.7. The weight and balance for each flight must account for the location of the wheels. If the wheels are left on the skids, the cruise speed will be approximately 2 MPH lower, with a corresponding reduction in range.

7-16. Baggage Compartment

A compartment for storage of baggage is provided in the area aft of the engine compartment. Access is through a single door located on the right-hand side which has a lock for external locking. The capacity of the compartment is approximately 6.3 cubic feet and it has an allowable loading capacity of 108 lb at Station 135.