ENSTROM 280FX OPERATOR MANUAL

AND

FAA APPROVED

ROTORCRAFT FLIGHT MANUAL

* * * * *

REPORT NO. 28-AC-020

TYPE CERTIFICATE NO. H1CE

HELICOPTER SERIAL NO.________________________

HELICOPTER REGISTRATION NO.________________________

* * * * *

THIS MANUAL MUST BE CARRIED IN THE HELICOPTER AT ALL TIMES. SECTIONS 2, 3, 4, AND 5 ARE FAA APPROVED. SECTION 10 INCLUDES SUPPLEMENTS TO THE TYPE CERTIFICATE WHICH ARE FAA APPROVED IF SO DESIGNATED.

FAA APPROVED BY:________________________

FOR MANAGER
CHICAGO AIRCRAFT CERTIFICATION OFFICE
CENTRAL REGION
FEDERAL AVIATION ADMINISTRATION

FAA APPROVAL DATE: MAR 26 2012

THE ENSTROM HELICOPTER CORPORATION
2209 22ND STREET
MENOMINEE, MICHIGAN 49858-3515

Rev. 6
Feb 21/12

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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**

<table>
<tr><td rowspan="4">14</td><td>FAA APPROVAL</td><td colspan="2">SUMMARY DESCRIPTION</td></tr>
<tr><td></td><td colspan="2">General updates</td></tr>
<tr><td colspan="2">RYAN B NELSON Digitally signed by RYAN B NELSON FTP, AIR-712, for</td><td>18 Oct 2024</td></tr>
<tr><td colspan="2">Manager, Flight Test & Human Factors Branch, AIR-710 Federal Aviation Administration</td><td>Approved Date</td></tr>
</table>

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

LOG OF SUPPLEMENTS

Supplement No.	Description	Date	FAA Approved
1	Wet/Dry Dispersal System	Jan 11/91	R. Adler
2	Float Landing Gear	Jul 12/85	G. Louser
3	External Loads	Jan 11/85	G. Louser
4	Snowshoe	May 22/89	P. Moe
5	Reserved		
6	Reserved		
7	Reserved		
8	Reserved		
9	Reserved		
10	Reserved		
11	Auxiliary Fuel Tank	Jan 11/85	G. Louser
12	Engine Exhaust Muffler	Jul 16/86	P. Moe

APPROVED FOR THE MANAGER
CHICAGO AIRCRAFT CERTIFICATION OFFICE
CENTRAL REGION
FEDERAL AVIATION ADMINISTRATION

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	Reserved			
7	Reserved			
8	Reserved			
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

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SECTION 1. GENERAL

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SECTION 1. GENERAL

1-1. Introduction

This manual contains the operating instructions, procedures, and limitations for the Enstrom 280FX helicopter. The manual is divided into two basic parts, the FAA approved Rotorcraft Flight Manual (RFM) and the Supplemental Data provided by Enstrom Helicopter Corporation. Sections 2 through 5 and portions of Section 10 so designated make up the FAA approved RFM. It is required by Federal Regulations that this manual be carried in the helicopter at all times.

1-2. Owner Responsibilities

Maintaining the helicopter in an airworthy condition is the responsibility of the owner. (Reference Section 8 for required inspections.) To aid the owner in this task, Enstrom Helicopter Corporation has a network of Distributors, Dealers, and Service Centers. In addition to this Operator's Manual, Enstrom Helicopter Corporation has the following technical publications available for your helicopter:

1. F-28F/280F Maintenance Manual with 280FX Supplement
2. F-28/280 Series Illustrated Parts Catalog
3. Service Information Letters
4. Service Directive Bulletins

Information regarding dealer and service center locations, technical publications and revisions can be obtained by contacting:

Enstrom Helicopter Corporation
Attn: Product Support
2209 22nd Street
Menominee, Michigan 49858-3515
customerservice@entromhelicopter.com

1-3. Pilot Responsibilities

The pilot is responsible for determining that the helicopter is safe for flight and is responsible for operating within the limitations specified in Section 2. The pilot should familiarize himself with the entire manual prior to receiving competent flight instruction.

1-4. Warnings, Cautions, and Notes

The use of WARNING, CAUTION, and NOTE to emphasize important and critical instructions is defined by the following.

1.

WARNING

An operating practice or procedure, which, if not correctly followed, could result in personal injury or loss of life.

2.

CAUTION

An operating practice or procedure, which, if not correctly followed, could result in damage to, or destruction of, equipment.

3.

NOTE

An operating practice or procedure, which is essential and requires additional information.

1-5. Specifications

1. Principle dimensions of 280FX helicopters (reference Figure 1-1).

Width overall	28 ft
Rotor diameter	32 ft
Height overall	9 ft
Length overall	
- Blade over tail	29 ft 3 in
- Blade over nose	36 ft 7 in
Cabin width at seat	58 in
Baggage box dimensions	16 in X 18 in X 31 in
Tread – landing gear	7 ft 4 in

2. Power Plant

Type	Lycoming
Designation	HIO-360-F1AD
Cylinders	4 Opposed
Horsepower	225 hp (sea level to 12,000 ft)
RPM	3050
SFC (full rich)	0.69 lb/hp/hr
Weight	357 lb
Oil	10 qt (8 qt 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).

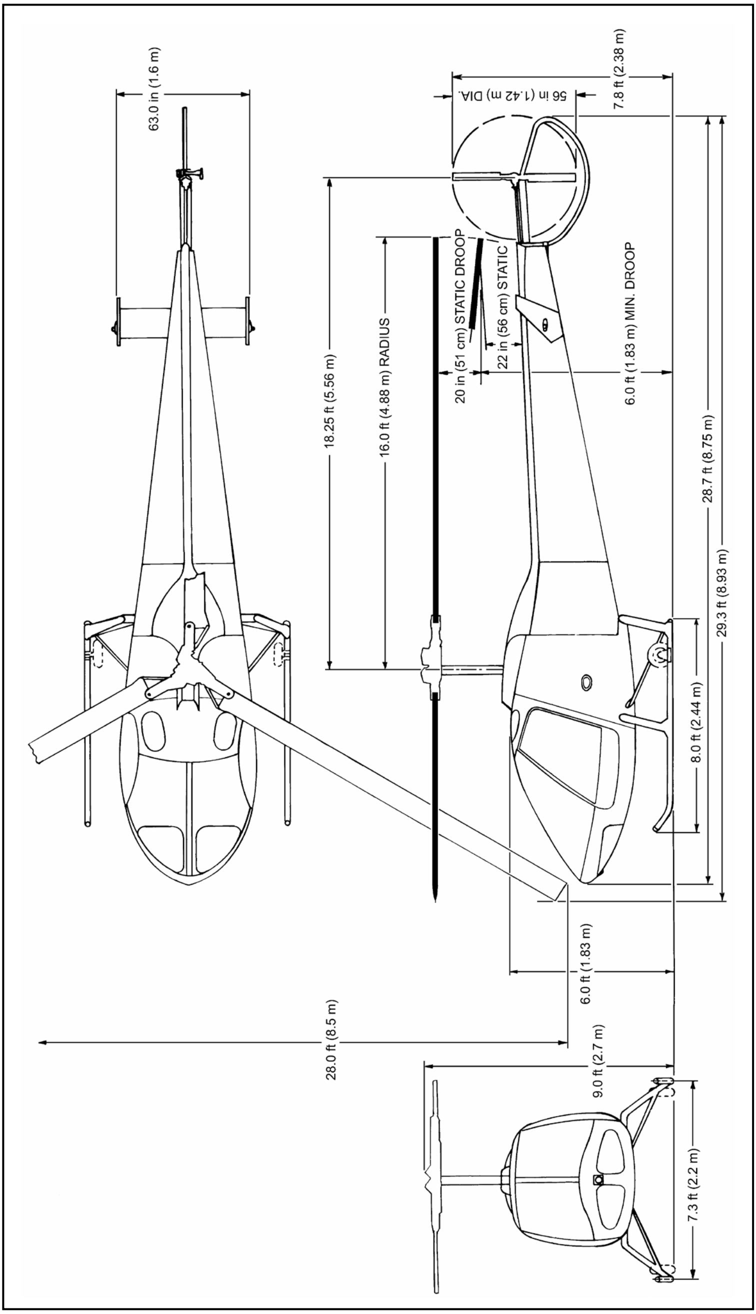

Figure 1-1. Enstrom 280FX

3. Ratios

Lower drive pulley to upper pulley	1.213:1 (3050-2514 RPM)
Upper pulley to main rotor shaft	7.154:1 (2514-351 RPM)
Engine to main rotor	8.678:1 (3050-351 RPM)
Tail rotor input shaft to output shaft	1:1

4. Rotor Systems

Number of blades, main rotor	3
Chord, main rotor blade	9.5 in
Disk area, main rotor	804 sq ft
Number of blades, tail rotor	2
Chord, tail rotor blade	4.4 in
Disk area, tail rotor	17.1 sq ft

5. Weight

Designed gross weight	2600 lb
Empty weight	1570 lb
Useful load	1030 lb
C.G. travel	96.3 to 98.0 inches at 2600 lb
	92.0 to 98.8 inches at 2350 lb
	92.0 to 100.0 inches at 2000 lb

NOTE

Four gross weight/c.g. envelopes apply to this helicopter (reference Figure 6-1). Each envelope is associated with a different maximum ceiling and a different V_{NE} limitation (reference Figure 5-1).

1-6. Performance[1]

1. Maximum speed	V_{NE} Power On	117 MPH IAS from sea level to 3000 ft DA[1] (Reference Figure 5-1)
	V_{NE} Power Off	85 MPH IAS from sea level to 8200 ft DA (Reference Figure 5-1)
NOTE **Four different maximum ceiling/V_{NE} envelopes apply to this helicopter (reference Figure 5-1). Each envelope corresponds to a gross weight/ c.g. envelope (reference Figure 6-1).**		
2. Cruise speed 75% power		110 MPH IAS at sea level
3. Maximum cruise speed		117 MPH TAS at sea level
		122 MPH TAS at 3000 ft H_d
4. Maximum range speed		85 MPH IAS at sea level
5. Fuel consumption 75% power, leaned		14.7 gal/hr
6. Maximum endurance, no reserve 57 MPH IAS at sea level, leaned		3.5 hr
7. Fuel capacity		42 gal (40 gal usable)
8. Maximum R/C at sea level		1450 ft/min
9. Hover ceiling IGE		13,600 ft (See Item 11)
10. Hover ceiling OGE		8700 ft
11. Maximum approved operating altitude		12,000 ft (Reference Figure 5-1)

[1] All altitudes are density altitude (DA) and performance based on a 2350 lb gross weight unless otherwise noted.

SECTION 2. OPERATING LIMITATIONS

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SECTION 2. OPERATING LIMITATIONS

2-1. Type of Operation

1. This helicopter is approved for operation under day and night VFR non-icing conditions.
2. Operation with doors removed is approved. All loose objects and equipment within the cabin must be properly secured.

NOTE

Refer to Section 6 for proper weight and balance calculations for operation with the doors removed.

2-2. Weight

1. The maximum gross weight of this helicopter is 2600 pounds (reference Figure 6-1).

2-3. Center of Gravity

NOTE

All airspeeds are IAS unless otherwise noted.

1. The longitudinal datum is 100.0 inches forward of the center of the main rotor head.
2. There are four gross weight/c.g. envelopes for this helicopter (reference Figure 6-1). Each envelope corresponds to one of four V_{NE}/altitude envelopes as described in Paragraph 2-4 (reference Figure 5-1).
3. Envelope A is the lightest weight envelope with a V_{NE} of 117 MPH at sea level. The c.g. and gross weight limits vary as follows:
   a. Upper weight limit is 2350 lb.
   b. Forward limit is at 92.0 inches.

c. Aft limit varies linearly from 94.6 inches at 2350 lb to 100.0 inches at 2000 lb. Aft limit at 100.0 inches below 2000 lb.

4. Envelope B is the next heavier envelope. It has a V_{NE} of 104 MPH. The c.g. and gross weight limits vary as follows:

   a. Upper weight limit is 2450 lb.

   b. Forward limit varies linearly from 93.8 inches at 2450 lb to 92.0 inches at 2350 lb.

   c. Aft limit varies linearly from 96.0 inches at 2450 lb to 99.2 inches at 2240 lb and 100.0 inches at 2000 lb.

   d. The lower limit corresponds to the upper and aft limits of Envelope A.

5. Envelope C has a V_{NE} at sea level of 91 MPH. The c.g. and gross weight limits vary as follows:

   a. Upper weight limit is 2550 lb.

   b. Forward limit varies linearly from 95.5 inches at 2550 lb to 93.8 inches at 2450 lb.

   c. Aft limit varies linearly from 97.3 inches at 2550 lb to 98.4 inches at 2470 lb and then to 99.2 inches at 2240 lb.

   d. The lower limit corresponds to the upper and aft limits of Envelope B.

6. Envelope D is the heaviest envelope. It has a V_{NE} at sea level of 85 MPH. The c.g. and gross weight limits vary as follows:

   a. Upper weight limit is 2600 lb.

   b. Forward limit varies linearly from 96.3 inches at 2600 lb to 95.5 inches at 2550 lb.

   c. Aft limit varies linearly from 98.0 inches at 2600 lb to 98.4 inches at 2470 lb.

   d. The lower limit corresponds to the upper and aft limits of Envelope C.

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).

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

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

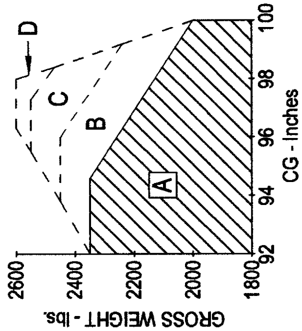
   e. This placard is to be placed adjacent to the collective friction device.

COLLECTIVE FRICTION TO BE USED FOR GROUND OPERATION ONLY

A

V_{NE} - IAS (MPH) FOR ENVELOPE 'A'

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F -20	0	20	40	60	80	100
SEA LEVEL	117	117	117	117	117	117	117
2000	117	117	117	117	117	114	109
4000	117	117	117	115	110	105	96
6000	117	116	111	105	96	87	78
8000	112	107	96	87	78	69	60
10,000	99	88	78	69	59		
12,000	81	70	60				



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B

V_{NE} - IAS (MPH) FOR ENVELOPE 'B'

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F -20	0	20	40	60	80	100
SEA LEVEL	104	104	104	104	104	104	104
2000	104	104	104	104	104	102	98
4000	104	104	104	102	99	94	85
6000	104	103	99	95	85	76	68
8000	100	96	86	76	67	58	
10,000	89	78	68	58			
10,800	81	70	60				

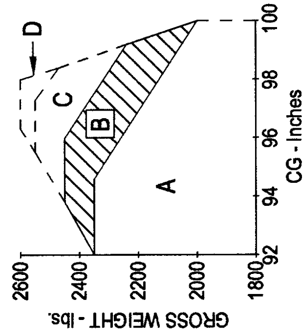

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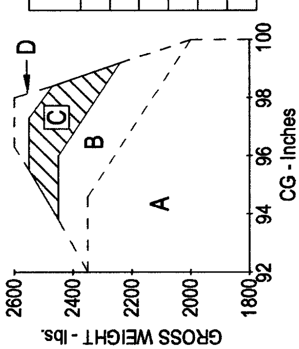
Figure 2-1. V_{NE} Placards – Envelopes A & B

C

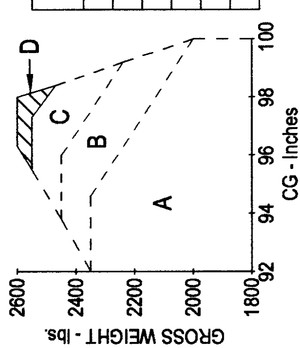


V_{NE} - IAS (MPH) FOR ENVELOPE 'C'

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F						
	-20	0	20	40	60	80	100
SEA LEVEL	91	91	91	91	91	91	91
2000	91	91	91	91	91	89	87
4000	91	91	91	90	87	83	74
6000	91	90	87	83	74	65	57
8000	88	85	75	65	56		
9600	81	71	61				

28-180047-11

D



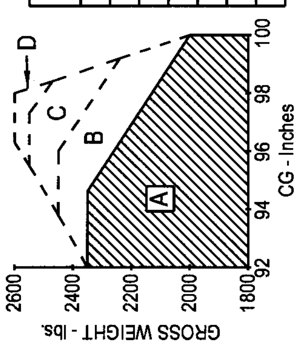
V_{NE} - IAS (MPH) FOR ENVELOPE 'D'

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F						
	-20	0	20	40	60	80	100
SEA LEVEL	85	85	85	85	85	84	83
2000	85	85	85	84	83	82	81
4000	85	84	83	82	81	78	69
6000	83	82	81	79	69	59	
8000	81	80	70	60			
9000	80	71	60				

28-180048-11

Figure 2-2. V_{NE} Placards – Envelopes C & D

A

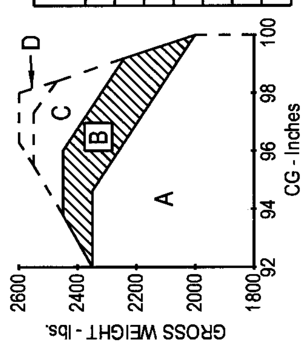


V_{NE} - IAS (MPH) FOR ENVELOPE 'A'

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F							
	-20	0	20	40	60	80	100	120
SEA LEVEL	117	117	117	117	117	117	117	117
2000	117	117	117	117	117	114	109	104
4000	117	117	117	115	110	105	96	87
6000	117	116	111	105	96	87	78	69
8000	112	107	96	87	78	69	60	
10,000	99	88	78	69	59			
12,000	81	70	60					

28-180045-13

B



V_{NE} - IAS (MPH) FOR ENVELOPE 'B'

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F							
	-20	0	20	40	60	80	100	120
SEA LEVEL	104	104	104	104	104	104	104	104
2000	104	104	104	104	104	102	98	94
4000	104	104	104	102	99	94	85	76
6000	104	103	99	95	85	76	68	60
8000	100	96	86	76	67	58		
10,000	89	78	68	58				
10,800	81	70	60					

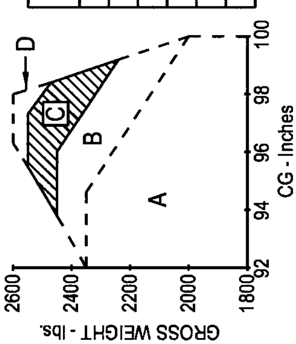
28-180046-13

Figure 2-3. V_{NE} Placards – Envelope A & B (w/120°F)

C

V_{NE} - IAS (MPH) FOR ENVELOPE 'C'

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F -20	0	20	40	60	80	100	120
SEA LEVEL	91	91	91	91	91	91	91	91
2000	91	91	91	91	91	89	87	85
4000	91	91	91	90	87	83	74	65
6000	91	90	87	83	74	65	57	
8000	88	85	75	65	56			
9600	81	71	61					

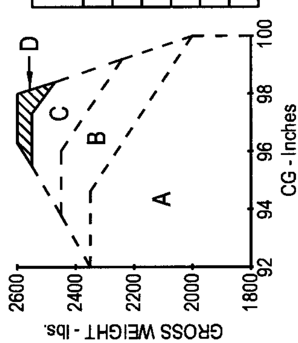


28-180047-13

D

V_{NE} - IAS (MPH) FOR ENVELOPE 'D'

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F -20	0	20	40	60	80	100	120
SEA LEVEL	85	85	85	85	85	84	83	82
2000	85	85	85	84	83	82	81	80
4000	85	84	83	82	81	78	69	60
6000	83	82	81	79	69	59		
8000	81	80	70	60				
9000	80	71	60					



28-180048-13

Figure 2-4. V_{NE} Placards – Envelope C & D (w/120°F)

2. This placard is to be placed in the baggage compartment.

MAXIMUM WEIGHT IN THIS COMPARTMENT IS 108 LBS. OBSERVE C.G. AND GROSS WEIGHT LIMITATIONS

3. This placard is to be placed on the clutch handle.

STOW FLAT ON FLOOR BEFORE FLIGHT

4. This placard is to be placed near the door handle.

EMERGENCY EXIT PULL DOOR HANDLE TO OPEN CABIN DOOR

INTENTIONALLY LEFT BLANK

SECTION 3. EMERGENCY PROCEDURES

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SECTION 3. EMERGENCY PROCEDURES

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SECTION 3. EMERGENCY PROCEDURES

GENERAL

3-1. General

This section describes the foreseeable system failures and malfunctions that may occur and establishes the emergency procedures used to maintain control and get the helicopter safely on the ground.

3.2. Definition of Terms

1. Immediate Emergency Actions. Those actions that must be performed immediately in an emergency procedure are underlined. These immediate emergency actions must be committed to memory.

NOTE

The urgency of certain emergencies requires immediate and instinctive action by the pilot. The most important single consideration is helicopter control. All procedures are subordinate to this requirement.

2. Urgency to Land
   a. Land Immediately - Perform a landing at the closest suitable landing site.
   b. Land as Soon as Practicable - Land at the nearest suitable airport or landing facility.

3-3. After Emergency Action

After a malfunction of equipment has occurred, appropriate emergency actions have been taken and the helicopter is on the ground, an entry must be made in the remarks section of the aircraft log book describing the malfunction. The helicopter shall not be flown until corrective action has been taken.

3-4. Emergency Exit

To exit the cabin in the event of an emergency, first attempt to open the doors. If the doors will not open, break the door windows, overhead windows, or windshields as the situation requires.

ENGINE

3-5. Engine Failure

The indications of an engine failure, either partial or complete power loss, are a left yaw and a drop in engine and main rotor RPM. If these conditions are encountered, the procedures to be followed are determined by the altitude and airspeed available to establish an autorotative glide, while maintaining control of the helicopter and maintaining sufficient rotor RPM for a successful landing.

NOTE

On aircraft S/N 2135 and prior, loss of rotor RPM will result in a LOW ROTOR RPM warning light and horn activation. On aircraft S/N 2136 and subsequent, the ROTOR RPM warning light and horn will activate when the rotor RPM exceeds the upper limit and when the rotor RPM falls below the lower limit.

1. Engine Failure – Altitude above 375 ft AGL

   If engine failure occurs, proceed as follows:

   a. Enter autorotation (collective full down, throttle to idle, and right pedal to trim helicopter).

   b. Stabilize at 58 MPH glide (best rate descent speed).

CAUTION

Due to high rates of descent, sustained autorotation speed is limited to 85 MPH or V_{NE} for the operating condition. Maximum glide distance in autorotation is attained at 80 MPH and 334 RPM. Reduce collective to build RPM prior to touchdown.

   c. Check engine and rotor RPM. Adjust collective to keep rotor in green arc.

   d. Select landing site.

NOTE

If engine is running and suitable landing site is not within glide distance, the pilot should attempt to fly the helicopter at reduced power settings to a favorable landing area. The pilot should be prepared for a complete loss of power at any time under these conditions.

e. If engine is stopped, turn OFF fuel boost pump and place mixture control in ICO position. If altitude and time permit, see Air Restart, step 2, below.

f. <u>At approximately 50 ft AGL, apply aft cyclic to reduce speed</u>.

g. <u>Level helicopter with forward cyclic</u> at an altitude sufficient to provide tail rotor clearance. As helicopter settles toward ground, <u>apply up collective to cushion landing</u>.

h. Maximum recommended ground contact speed on prepared surfaces is 35 MPH. Reduce speed on rough surfaces.

CAUTION

Avoid rapid lowering of collective or use of aft cyclic after ground contact or during ground slide.

2. Air Restart

If an engine failure occurs in flight, the decision to attempt a restart will depend on the altitude and potential landing areas available.

CAUTION

Helicopter control is primary concern after entering autorotation. DO NOT attempt air restart if control will be jeopardized. <u>DO NOT</u> attempt air restart when below 3000 ft AGL.

a. Adjust collective as required to maintain rotor RPM in green arc and establish 58 MPH autorotative glide.

b. Select landing site.

c. Grip cyclic between knees and with right hand turn fuel boost pump OFF and pull mixture control to idle cut off.

d. Rotate throttle to start position (start index up).

e. Engage starter.

f. When engine fires, mixture full rich and boost pump ON.

g. Slowly increase throttle until engine and rotor tach needles join in green arc.

3. Engine Failure – Altitude above 10 ft and below 375 ft AGL

If an engine failure occurs at low altitude and low airspeed, sufficient altitude may not be available to increase rotor RPM. The collective must be adjusted for the conditions in order to reach the touchdown point without excessive rotor droop. The collective reduction will vary from no reduction at zero airspeed and 10 feet to full down collective at higher altitudes and airspeeds. If engine failure occurs, proceed as follows:

a. <u>Adjust collective to maintain rotor RPM, throttle to idle position and right pedal to trim helicopter</u>.

b. <u>Adjust cyclic for autorotative glide</u>.

NOTE

At higher altitudes and low airspeed use forward cyclic to increase forward speed to approximately 58 MPH. At low altitudes and higher airspeed aft cyclic will be required to reduce speed prior to ground contact.

c. <u>At altitude of approximately 50 ft AGL, use aft cyclic to reduce forward speed</u>.

d. Level helicopter with forward cyclic at an altitude sufficient to provide tail rotor clearance.

e. As helicopter settles toward the ground, apply up collective to cushion landing.

f. Maximum recommended ground contact speed on prepared surfaces is 35 MPH. Reduce speed on rough surfaces.

CAUTION

Avoid rapid lowering of collective or use of aft cyclic after ground contact or during ground slide.

4. Engine Failure – At Hover in Ground Effect

Engine failure at a hover is indicated by a sudden yawing of the helicopter to the left. Avoid sideward or rearward movement after engine failure and proceed as follows:

a. Apply right pedal to prevent yawing and align skids in direction of motion.

b. DO NOT reduce collective.

c. As helicopter settles to the ground, apply up collective to cushion landing.

3-6. Low Engine Oil Pressure

1. Low Oil Pressure and Normal Oil Temperature

If low oil pressure is accompanied by normal oil temperature there is a possibility the oil pressure gauge or relief valve is malfunctioning. This is not necessarily cause for an immediate precautionary landing. Proceed as follows:

a. Land at nearest suitable landing area.

b. Inspect for and correct this source of trouble before continuing flight.

2. Total Loss of Oil Pressure

   If a total loss of oil pressure is accompanied by a rise in oil temperature, this is a good indication that engine failure is imminent. Proceed as follows:

   a. Reduce engine power immediately.

   b. Select a suitable forced landing field and land with power.

3-7. Turbocharger or Wastegate Failure

Turbocharger or wastegate seizure will be evidenced by loss of manifold pressure, if operating at manifold pressures above ambient pressure. It should be possible to maintain level flight at reduced airspeeds and altitudes as the engine should be capable of maintaining manifold pressure equal to ambient pressure. If the wastegate seizes, it may take considerable force on the throttle twist grip to separate the linkage between the throttle and the wastegate. If the turbocharger seizes or the wastegate seizes in the full bypass condition, proceed as follows:

1. Perform a power check to confirm power available for landing.

2. Land as soon as practicable, using running landing (reference Section 4, para. 4-18).

DITCHING

3-8. Ditching Without Power

If engine failure occurs over water, accomplish engine failure emergency procedure and proceed as follows:

1. Unlatch doors.
2. Complete normal autorotational landing in water.
3. As collective reaches full up position and helicopter settles in water, apply full lateral cyclic in direction helicopter tends to roll.

WARNING

Clear helicopter as quickly as possible.

4. Pilot and passengers exit helicopter when main rotor stops.

3-9. Ditching With Power

If ditching is unavoidable without other recourse, proceed as follows:

1. Descend to low hovering altitude over water.
2. Unlatch both doors.
3. Exit passengers.
4. Hover clear of passengers.
5. Turn off master and alternator.
6. Close throttle and complete hovering autorotation.
7. As collective reaches full up position and helicopter settles into water, apply full right lateral cyclic.

WARNING

Clear helicopter as quickly as possible.

8. Exit helicopter when rotor stops.

ROTORS, TRANSMISSIONS, AND DRIVE SYSTEMS

3-10. Rotor RPM Light Illumination (If Equipped)

If the ROTOR RPM warning light illuminates, immediately lower the collective to increase the RPM or raise the collective to reduce the RPM as required to return the RPM to the normal operating range. The only exception to this requirement is when the light illuminates because the RPM is low during an autorotational flare immediately prior to touchdown. After adjusting the collective, continue to monitor the tachometer and control the RPM by manipulating the throttle and collective.

3-11. Tail Rotor Malfunctions

Because of the many different malfunctions that can occur, success in coping with tail rotor malfunctions depends upon recognition of the condition and use of the proper emergency procedure. The following is a description of the three basic types of malfunctions and appropriate emergency procedures to follow.

1. Complete Loss of Tail Rotor Thrust

   This condition can be caused by a failure of the tail rotor drive system or a failure of the control system which would allow the blades to assume a neutral pitch condition.

   a. Hovering Flight

   When tail rotor thrust is lost in hovering flight the helicopter will rotate rapidly to the right, even with full application of left pedal. Proceed as follows:

   (1) Roll throttle off to full idle position. Helicopter will slow down or stop rotation.

   (2) As helicopter settles to ground, cushion landing with up collective (throttle off).

   b. During Flight

   The helicopter will yaw to the right with full application of left pedal.

If suitable landing area is not available within autorotative glide distance, pilot should proceed as follows:

(1) Use cyclic for directional control and collective and power settings to maintain 60 to 80 MPH with the yaw a maximum of 45°.

(2) Continue flight in this fashion using cyclic stick for directional control until suitable auto-rotational landing site is reached.

(3) Complete autorotational landing.

2. Fixed Pitch Setting

This is a malfunction involving loss of control resulting in a fixed pitch setting. Whether the nose will rotate left or right depends upon the setting of the pedals when the controls were jammed or locked.

a. Fixed Right Pedal

If the tail rotor pitch becomes fixed during an approach or low power setting, the nose will turn to the right when power is applied. Proceed as follows:

(1) Maintain 24 inches manifold pressure and 50 MPH.

(2) Fly to suitable area and complete a shallow power on approach at 50 MPH.

(3) Adjust throttle and collective pitch so the helicopter touches down straight ahead at an airspeed of 0-10 MPH. Slight left or right throttle adjustments can be used to control heading during touchdown. Reduce throttle and collective cautiously as skids contact surface.

CAUTION

DO NOT abort the emergency landing after airspeed has diminished below 40 MPH.

b. Fixed Left Pedal

If the tail rotor pitch becomes fixed during cruise or high power settings, the helicopter will yaw to the left when power is reduced below 23 inches manifold pressure. Power settings above 23 inches manifold pressure will produce near normal flight conditions at airspeeds above 60 MPH. Proceed as follows:

(1) Fly to suitable landing area at a power setting of at least 23 inches manifold pressure and 60 MPH or above.

(2) Complete a shallow power-on approach at 60 MPH.

CAUTION

DO NOT AUTOROTATE.

(3) Adjust throttle and collective pitch so that the helicopter touches down straight ahead at an airspeed of 0-10 MPH.

(4) Reduce throttle and collective pitch cautiously as skid gear contacts surface.

NOTE

Application of power to settings greater than 23 inches manifold pressure will make the helicopter more controllable. Therefore, landing attempt may be aborted and new approach initiated, if required.

3. Loss of Tail Rotor or Components

The amount of weight lost will determine the helicopter reaction. If a small amount of weight is lost, the situation would be similar to a loss of thrust situation. If a large amount of weight is lost and there is a drastic forward shift in c.g., immediate autorotation is the only emergency procedure available.

3-12. Main Rotor Gearbox and Tail Rotor Gearbox

1. Main Rotor Transmission Temperature

   If the main rotor transmission temperature exceeds red line, reduce power. If the temperature remains above red line, make a power-on landing as soon as possible.

2. Main Rotor Transmission Chip Light

   If the main rotor transmission chip light (MRGB CHIP) comes on in flight and the transmission temperature is below the red line, monitor the temperature and land as soon as practicable. On landing, remove and inspect the chip detector (reference NOTE below).

   If the main rotor transmission chip light is accompanied by high transmission temperatures, land as soon as possible.

3. Tail Rotor Transmission Chip Light

   If the tail rotor transmission chip light (TRGB CHIP) comes on in flight, make a power-on landing as soon as practicable and inspect the chip detector (reference NOTE below).

NOTE

New or recently overhauled gearboxes generally generate a ferrous "fuzz" which will collect around the chip detector as a gray sludge. This type of contamination is normal and may be cleaned off with a soft cloth, and the chip detector may be reinstalled and the flight continued. Any metallic chip greater than 1/16 inch in diameter or cross section, or chip light accompanied by high transmission temperature is cause for discontinuation of normal flight. In the event of finding large chips, please contact your nearest Enstrom Service Center or the Enstrom Product Support. Specific instructions in removal, checking, and reinstallation of the chip detector may be found in Section 8, para. 8-5, item 11.

3-13. Clutch Disengagement Light (CLUTCH ENGAGE) On

Should the manual clutch become disengaged during flight, it will result in an instantaneous engine overspeed and severe left yaw if manifold pressure is much above idle. These indications will be instantaneous and the pilot should immediately enter autorotation. If the clutch disengaged light illuminates without engine overspeed or severe yaw, it may mean that a clutch disengagement is probable or that the microswitch or electrical circuit has malfunctioned. The pilot should proceed as follows:

1. Clutch Disengagement Light On with Motion Cues
   a. <u>Enter autorotation and reduce power to idle</u>.
   b. <u>Perform autorotative landing</u>.
   c. Inspect for and correct the source of trouble before continuing flight. Refer to the F-28F/280F Series Maintenance Manual for engine overspeed trouble-shooting (para. 3-3 G.).
2. Clutch Disengagement Light On Without Motion Cues
   a. Reduce power and be prepared for sudden clutch disengagement.
   b. Land at nearest suitable landing area.

CAUTION

Be prepared for autorotation should clutch become disengaged.

   c. Inspect for and correct the source of trouble before continuing flight.

FIRE

3-14. Fire in Flight

If fire, smoke, or the odor of smoke is detected in flight, proceed as follows:

1. Turn the master and alternator switch to the OFF position.
2. Land immediately using power-on approach.
3. If smoke obstructs vision, unlatch doors and let them trail open.
4. Shut off engine as soon as helicopter is on the ground.
5. Shut fuel valve OFF.
6. Pilot and passengers clear the helicopter immediately.

3-15. Fire on the Ground

If fire, smoke, or the odor of smoke is detected, proceed as follows:

1. Shut off engine and all switches.
2. Shut fuel valve OFF.
3. Pilot and passengers clear the helicopter immediately.

ELECTRICAL SYSTEM

3-16. Alternator Malfunction

A malfunction of the alternator will be indicated by zero charge rate or constant discharge on the ammeter, or the LOW VOLTAGE caution segment on later production helicopter will illuminate. To put the alternator back on the line, proceed as follows:

1. Alternator circuit breaker in.
2. Alternator excite circuit breaker in.
3. Cycle alternator switch.
4. If alternator is not restored or goes off the line again, turn off all nonessential electrical equipment and land as soon as practicable.

3-17. Starter Relay Light On

Later production helicopters are equipped with a STARTER RELAY warning segment in the annunciator panel. This light illuminates any time the main contacts of the starter relay are closed. During normal operations, the only time the light will illuminate is when the engine is being started. Depending on the cause of the malfunction, there may be significant power loss as the magnetos revert to the starting configuration, that is, one magneto off and the other running at retarded timing. If the STARTER RELAY light illuminates when the engine is not being started, proceed as follows:

1. Aircraft On Ground
    a. Turn START switch/circuit breaker OFF.
        (1) If light extinguishes, shut down the engine using normal procedures and determine cause for the light illumination.
        (2) If light does not extinguish, proceed to next step.
    b. Shut down the engine immediately.
    c. Turn all electrical switches OFF.

d. Shut fuel valve OFF.

e. Pilot and passenger(s) clear the helicopter immediately.

f. If possible, disconnect the battery.

2. Aircraft in Flight

a. Turn START switch/circuit breaker OFF.

(1) If light extinguishes, land as soon as practicable, shut down the engine using normal procedures and determine cause for the light illumination.

(2) If light does not extinguish, proceed to next step.

b. Land immediately using power-on approach.

c. Turn all electrical switches OFF.

d. Shut down the engine immediately after the helicopter is on the ground.

e. Shut fuel valve OFF.

f. Pilot and passenger(s) clear the helicopter immediately.

g. If possible, disconnect the battery.

3-18. Engine Monitor Failure

NOTE

The following applies to aircraft equipped with either the GEM 600 series or the EDM-700 engine monitors.

During flight, a faulty channel or probe will cause a missing column or blank digital data on the engine monitor display. Proceed as follows for the type of indication failure encountered.

1. TIT indication failure:

a. Leave the mixture at the current setting as long as the engine power is not increased. If the mixture was leaned using TIT, enrich the mixture prior to increasing the power setting.

NOTE

EGT indications are considered informational; however, it is recommended to monitor remaining EGT indications in the event one or more EGT indication failure(s) occur while fuel mixture leaning in flight.

2. EGT indication failure:

   a. If one or more EGT indications fail, monitor the remaining EGT indications and TIT.

   b. If all EGT indications fail, monitor TIT.

NOTE

Primary CHT indication is provided by the CHT gauge on the instrument panel. CHT indications from the engine monitor are considered informational only.

3. CHT indication failure:

   a. If one or more CHT indications fail, monitor the remaining CHT indications and the CHT indicator in the instrument cluster.

   b. If all CHT indications fail, monitor the CHT indicator in the instrument cluster.

NOTE

Auxiliary indications (if equipped) are also informational and will not affect further flight if a failure occurs.

4. Other indication failure (if equipped; OAT, CLD, DIF, BAT):

   a. Any failure of these will not affect further flight.

FUEL SYSTEM

3-19. Electric Boost Pump Failure

WARNING

Illumination of the LOW FUEL PRESS warning light can indicate fuel exhaustion and impending engine stoppage.

Failure of the electric fuel boost pump will be indicated by illumination of red, low boost warning light. With sufficient fuel supply, the engine will continue to function.

If the LOW FUEL PRESS warning light comes on, verify fuel quantity and land as soon as practicable. If fuel quantity is zero or low, prepare for engine stoppage.

FLIGHT CONTROLS

3-20. Abnormal Vibrations

Vibrations in this helicopter can usually be classified as either low frequency or high frequency. Low frequency vibrations are generally caused by the main rotor system while the high frequency vibrations usually originate from the engine, drive system, or tail rotor. Any abnormal vibrations are an indication that something is not correct and should be referred to a mechanic before further flight. If a vibration suddenly appears during a flight, it is an indication that something has suddenly changed. The helicopter should be landed as soon as practical and inspected to find the cause of the vibration. After the cause of the vibration has been identified, the pilot and the mechanic can determine whether the helicopter can be safely flown or should be repaired before further flight. An abnormal vibration is reason to get the aircraft down as soon as possible, but the pilot must also use caution and select the safest possible landing site, working around wires, people, and other obstructions.

3-21. Cyclic Trim Failure

Failure of the cyclic trim control system will result in either inoperative trim or a trim runaway in one of the four primary directions (forward, aft, left or right). If the trim circuit breaker trips, it should be left out for the remainder of the flight. Depending upon the failure mode and the flight condition at the time of failure, the cyclic forces may be relatively light or they may be excessive. The pilot should evaluate the situation and determine if a precautionary landing is indicated or if the flight should be completed as planned. The pilot should be aware that the cyclic forces will change between cruise flight and approach and landing.

If the trim stops operating when the switch is engaged, the trim does not stop when the switch is released, or if the circuit breaker trips, the operator should:

1. Immediately stop using the trim and pull the TRIM circuit breaker to deactivate the circuit. Leave the circuit breaker out for the remainder of the flight.

2. If the pilot determines the flight can be continued safely, without use of the trim, flight may be continued to the next destination.

3. If the pilot has any safety concerns, a landing should be made as soon as practical.

   a. If there is a significant reduction in the longitudinal control, the pilot should plan a landing at a shallow approach to an area where a run-on landing can be made.

      i. Avoid any maneuvers, such as rapid decelerations, which may require forward cyclic for recovery.

      ii. Perform a run-on landing as there may not be enough forward cyclic to level the aircraft and stop rearward motion if it is allowed to start drifting rearward from a hover.

   b. If there is a significant reduction in the lateral cyclic control, it may be difficult or impossible to make turns to the right.

      i. The pilot should plan a landing to an area where there is ample room to maneuver. The aircraft will fly in a right crab, and maintaining a straight course may be difficult.

      ii. Lateral course corrections can be made using pedal and longitudinal cyclic, but the aircraft may not be aligned with the ground course.

      iii. Perform an approach to a low hover; forward speed can be stopped, but there may be some sideward drift.

      iv. Once forward speed is reduced in a low hover, the pilot can roll off the throttle and align the aircraft with the direction of motion using the pedals prior to touching down.

      v. If the pilot is having difficulty maintaining the approach course, the pilot should consider making a 360° turn to the right to line up on the final approach again.

vi. Directional control is easier to maintain at airspeeds above 60 knots, but the pilot must plan to reduce forward speed prior to touchdown.

4. Ground the aircraft at the end of the flight. The aircraft should be grounded until the problem is resolved by a maintenance technician.

3-22. Lamiflex Bearing Failure

A lamiflex bearing failure will cause a rough ride. Initially, this may be only a minor distraction, but in some cases, it can progress quickly to the point where the bearing physically comes apart. In this case, control of one blade will be stiff, the main rotor will be severely out of balance, and aircraft control may be in jeopardy. The following are indications of a lamiflex bearing failure as it progresses.

1. A significant worsening of the ride quality from one flight to the next or from one day to the next for no apparent reason.

2. The aircraft cannot be trimmed at a hover or runs out of trim at maximum forward flight speed when previously there was no problem.

3. The collective suddenly ratchets when moved up and down when previously it had been smooth or the collective suddenly feels heavy.

4. The cyclic suddenly wobbles or moves in a circular motion when previously it had been smooth.

5. The cyclic suddenly starts "chucking," (moving sharply in a left rear to right forward direction in about a 3/4" amplitude with a very crisp motion) especially at high power or high airspeed.

WARNING

This last indication where the cyclic starts sharply moving may be followed within a few minutes by a total failure of the bearing.

Emergency Procedures – Impending Lamiflex Bearing Failure

The following are the procedures to be used in dealing with lamiflex failures. Refer to the preceding paragraph for the description of the failure symptoms.

1. Moderate – Slight worsening in ride or not able to trim:
   a. **LAND** – As soon as practicable. Have all three bearings inspected before the next flight.
2. Serious – Ride continues to get worse or the cyclic or collective start showing symptoms:
   a. **LAND** – Immediately. Have all three bearings inspected before further flight.

Emergency Procedures – Total Lamiflex Bearing Failure

The following are the procedures to be used in dealing with total lamiflex bearing failure.

1. Maintain control of the aircraft.
2. Collective – Lower slowly. Commence an 800-900 ft/min descent.

WARNING

Do NOT autorotate. Aircraft control at the termination of an autorotation may be questionable with a totally failed lamiflex.

3. Airspeed – Reduce to 50-60 MPH.
4. Rotor RPM – Reduce to minimum power on RPM.
5. Maneuvering – Minimize.
6. Land – Perform a running landing. Touch down at or above Effective Translational Lift (ETL), approximately 20 knots if terrain permits.

WARNING

It may not be possible to control the aircraft in a hover.

7. Shutdown – Complete.

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SECTION 4. NORMAL PROCEDURES

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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.

4-4. 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.

4-5. 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 (para. 8-5, item 8, steps a, b, and c). The strut extension may be checked with the backside of the fuel dipstick (reference Figure 4-1).

NOTE

Align fuel dipstick with centerline on fairing bump. Sight across top of cross tube. Normal operating levels are indicated on the stick.

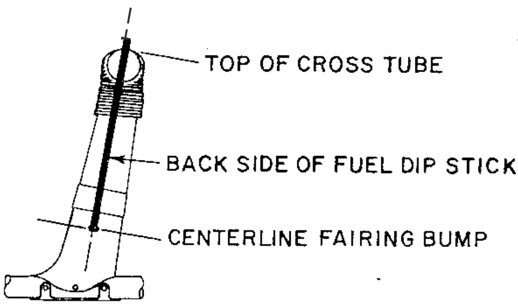

Figure 4-1. Strut Extension Check

7. Right landing gear – check condition and security. Check ground handling wheel removed or 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 lines – secure and no signs of leakage.

   d. Oil lines – secure and no signs of leakage.

   e. Exhaust – no cracks or signs of leakage.

   f. 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 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 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, 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.

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. 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

reduce throttle slightly in anticipation of this increase. After this adjustment, the pilot should not need to "chase" the RPM.

5. 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. Refer to the Height-Velocity Diagram, Figure 5-5 or Figure 5-7, for recommended takeoff profile.

4-14. Maximum Performance Takeoff

1. Stabilize at 2 ft hover aligned with desired takeoff course. Check hover power.
2. Smoothly apply forward cyclic to begin acceleration into effective translational lift.
3. 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 280FX is equipped with a full-time turbocharger, the aircraft is equipped with an OVERBOOST warning light to warn the pilot of a potential overboost condition. Transient overboost conditions that may trigger the warning light may not show as overboost conditions on the manifold pressure gauge and the overboost light may come on slightly before the red line on the manifold pressure gauge. The manifold pressure gauge, not the warning light, is the determining factor in ascertaining the magnitude of an overboost condition. Valid overboost conditions must be logged in the engine log and inspections performed per the latest revision of Lycoming Service Bulletin 592.

4. 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.

4-15. [Reserved]

4-16. Cruise

1. Maintain 3050 RPM and 29 inches manifold pressure, or less, in level flight.
2. Set cyclic trim.
3. Lean fuel mixture to approximately 90 lb/hr at 29 inches manifold pressure.
4. Monitor TIT.

NOTE

Allow a few minutes for temperature to stabilize. DO NOT exceed 1650°F TIT. Make fine adjustments to attain desired fuel flow and cross check cylinder head temperature and oil temperature. If temperatures are too high, enrich mixture until temperatures remain within limits.

5. Any increase in power setting above 29 inches should be accompanied by setting the mixture to full rich.

CAUTION

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

4-17. Practice Autorotations

1. Assure that helicopter is in a position to reach a suitable landing area in autorotative glide.
2. Airspeed between 50 and 80 MPH.
3. Lower collective to full down position and needle will split (i.e., DO NOT ADJUST THROTTLE). In the event a power recovery is desired, raise collective to flight condition. RPM will return to original setting.
4. Monitor rotor tachometer and adjust collective as required to maintain rotor speed in green arc.
5. At approximately 50 ft AGL, apply aft cyclic to reduce speed.
6. If touchdown autorotation is desired, roll off throttle to idle position for landing before raising collective.

CAUTION

AVOID throttle chops to full idle at altitudes 7,000 ft above base altitude where engine idle was adjusted. Engine idle speeds at altitude will be less than those set at base altitude conditions and engine stoppage is possible.

7. Level aircraft and cushion landing by raising collective.
8. If power recovery is desired, adjust throttle to maintain engine RPM in the normal operating range. If the throttle was not adjusted when the collective was lowered, very little adjustment should be needed when it is raised.

CAUTION

When making power recovery, avoid rapid throttle movements until the rotor and engine tachometer needles are joined to prevent damage to the free-wheeling clutch.

4-18. Landing

1. Mixture control to 1450°F TIT.

2. Maintain RPM within normal operating range as collective is reduced.

3. Landing light ON, if required.

4. Adjust collective and altitude to establish 8° to 10° approach angle. Adjust airspeed to 60 MPH.

NOTE

During transition into a descent from cruise, the RPM may have a tendency to fall below the green arc. In this case, the pilot should increase throttle slightly in anticipation of this decrease. After this adjustment, the pilot should not need to "chase" the RPM.

5. As the landing area is approached, reduce the airspeed and rate of descent until a zero ground speed hovering altitude of 2-5 ft is attained.

NOTE

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

4-19. Running Landing

1. Use shallow approach angle.

2. Maximum recommended ground contact speed on smooth surface is 35 MPH. Reduce speed on rough surfaces.

CAUTION

Avoid rapid lowering of collective pitch after ground contact, as rapid deceleration and nose down pitching may result.

4-20. After Landing

1. Collective down and locked.
2. Landing lights OFF.
3. Radio(s) OFF.
4. Reduce throttle to 2000 RPM for one minute.
5. Throttle to idle (1500 RPM).
6. Clutch disengaged.

CAUTION

Clutch disengagement with throttle open will result in engine overspeed. Clutch disengagement is signaled by a red warning light on the instrument console.

7. Idle engine at 1500 RPM for 2 minutes or until cylinder head temperature cools to 300°F.
8. Boost pump OFF.
9. Mixture control to idle cutoff position.
10. Ignition switch OFF.
11. Master and all other switches OFF.

4-21. General Operation Procedures

Throughout the flight envelope, avoid maneuvers that require full tail rotor pedal input or rapid tail rotor reversals. Although this type of pedal input may be necessary in some normal operations such as hovering downwind or hovering in gusty conditions, the pilot should avoid excessive pedal movement except as necessary for normal flight operations.

SECTION 5. PERFORMANCE

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5-1. V_{NE} Density Altitude Chart

The solid V_{NE}/altitude curves shown in Figure 5-1 apply only to operation with the c.g. within the appropriate areas shown in Figure 6-1.

Example: Helicopter c.g. is 96.0 inches at 2200 lb, use Envelope A V_{NE}.

Example: Helicopter c.g. is 93.0 inches at 2350 lb, use Envelope A V_{NE}.

Example: Helicopter c.g. is 96.5 inches at 2300 lb, use Envelope B V_{NE}.

Example: Helicopter c.g. is 95.0 inches at 2400 lb, use Envelope B V_{NE}.

Example: Helicopter c.g. is 98.0 inches at 2400 lb, use Envelope C V_{NE}.

Example: Helicopter c.g. is 96.0 inches at 2550 lb, use Envelope C V_{NE}.

Example: Helicopter c.g. is 97.0 inches at 2560 lb, use Envelope D V_{NE}.

NOTE

Use Figure 6-1 to determine actual location of c.g.

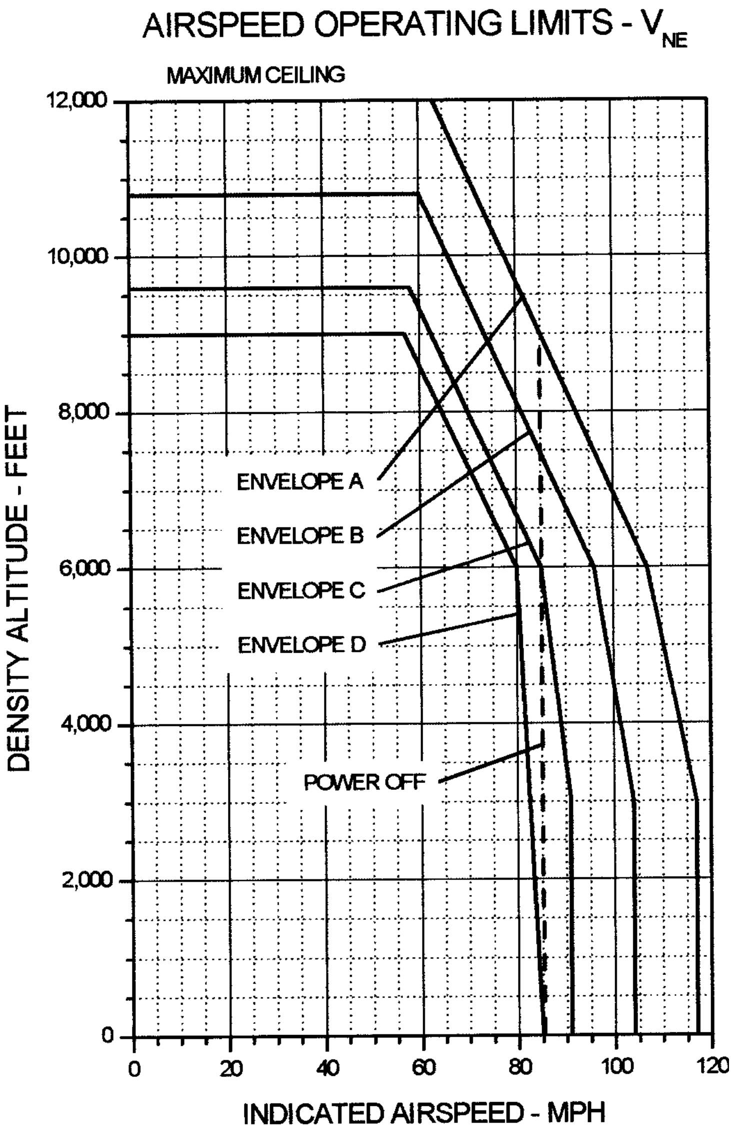

Figure 5-1. V_{NE} Variation with Density Altitude

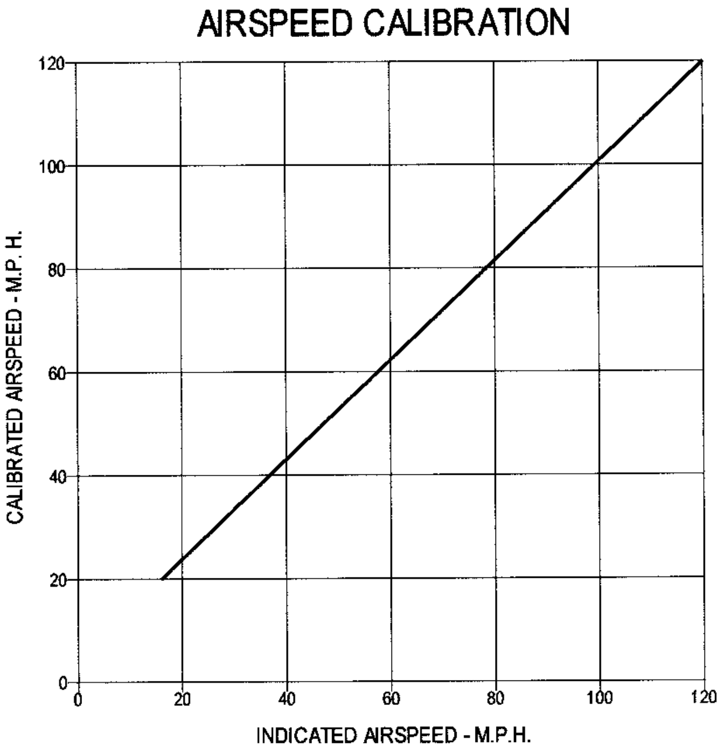

Figure 5-2. Airspeed Calibration

NOTE

Indicated speeds below 20 MPH are not reliable.

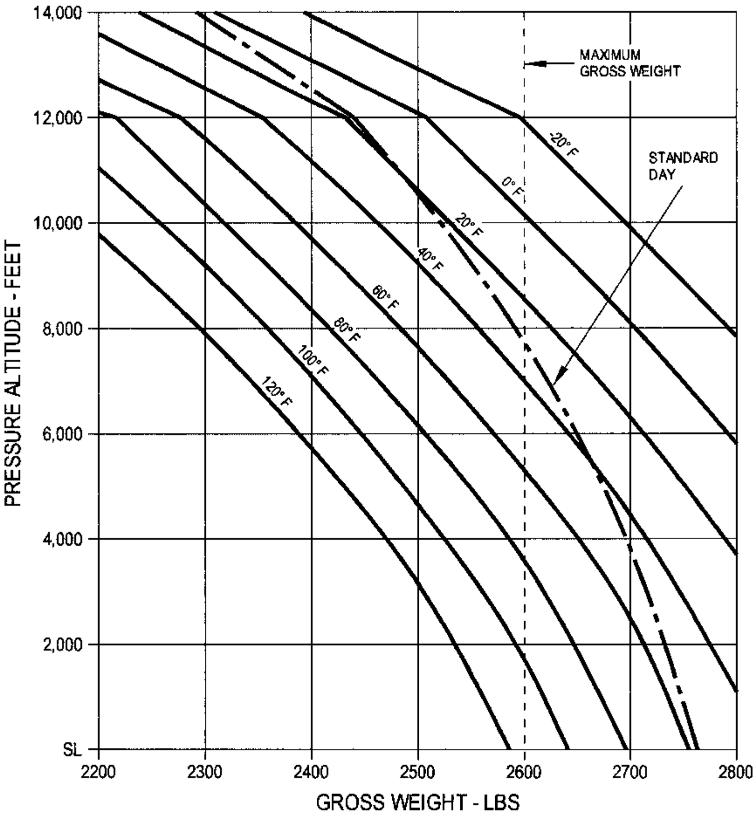

Figure 5-3. Hover Ceiling In-Ground Effect

2 ft Skid Height

350 Rotor RPM

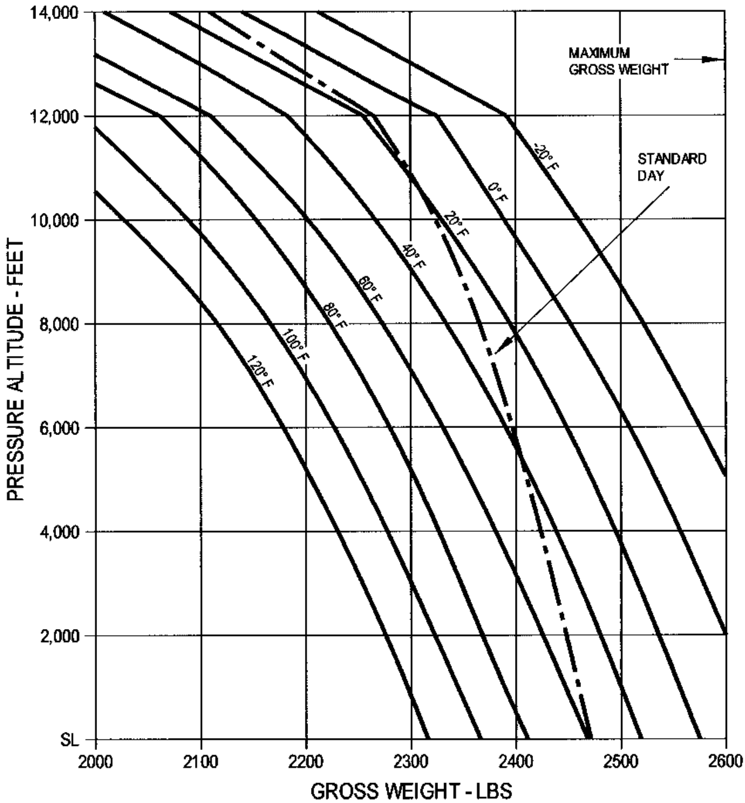

Figure 5-4. Hover Ceiling Out-of-Ground Effect

40 ft Skid Height

350 Rotor RPM

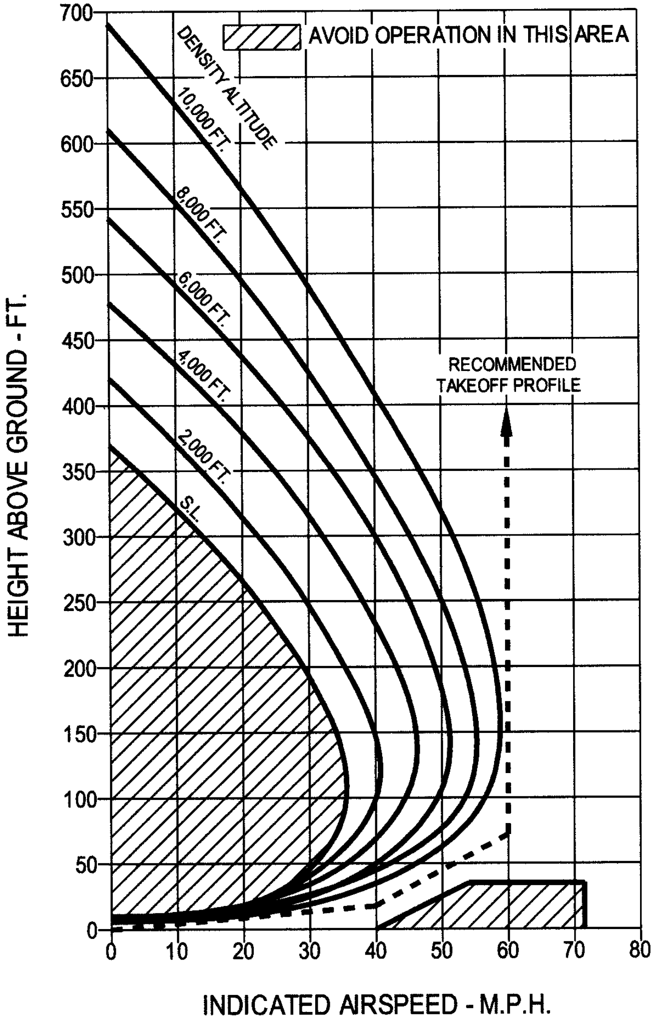

Figure 5-5. Height Velocity Diagram

2350 lb Gross Weight

NOTE

Tests conducted on prepared surfaces.

5-2. Effect of Loading on Choice of H-V Envelope

The H-V curves presented in Figure 5-5 are valid for operations at 2350 lb gross weight for the specific density altitude conditions presented. For operation at other than 2350 lb gross weight, determine the proper H-V curve to be used for the intended gross weight and density altitude for the flight from the curves presented in Figure 5-6 below. For operations above 2500 lb gross weight, use the H-V curves presented in Figure 5-7 in place of Figures 5-6 and Figure 5-5.

1. A gross weight of 2000 lb and 3900 ft H_d would allow the use of the sea level envelope.

2. A gross weight of 2200 lb and 4500 ft H_d would require a 2800 ft curve. To be conservative, use the next higher curve, 4000 ft.

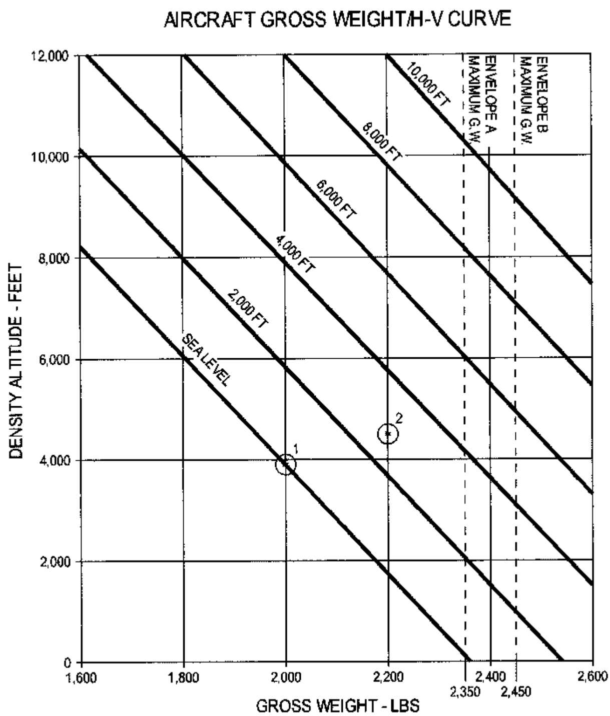

Figure 5-6. Effect of Loading on Choice of H-V Envelope

NOTE

Altitude operations may also be limited by V_{NE} and OGE hover. Cross check Figure 5-1 and Figure 5-4 for intended operations when using this figure.

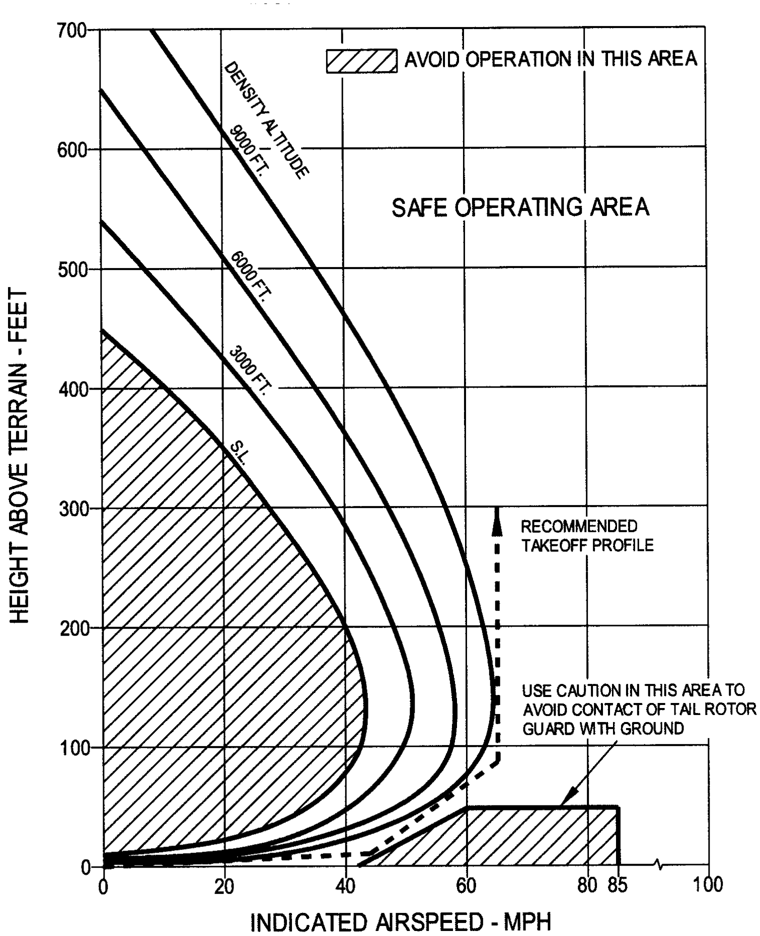

Figure 5-7. Height Velocity Diagram

2600 lb Gross Weight

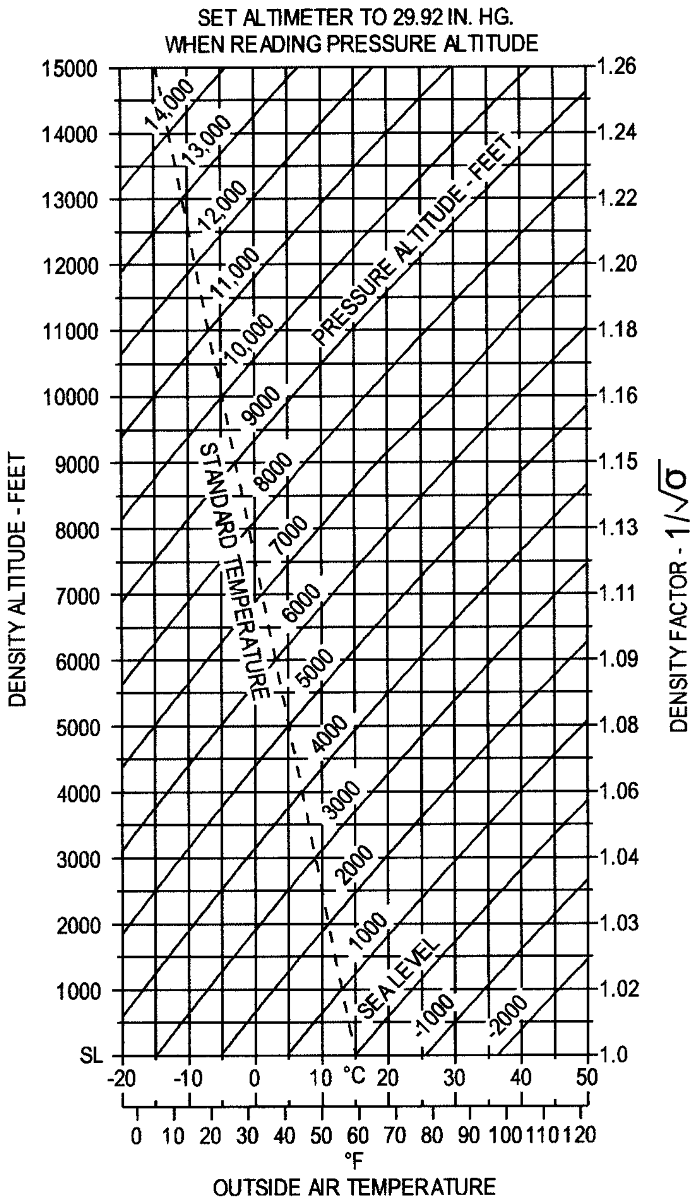

Figure 5-8. Density Altitude Chart

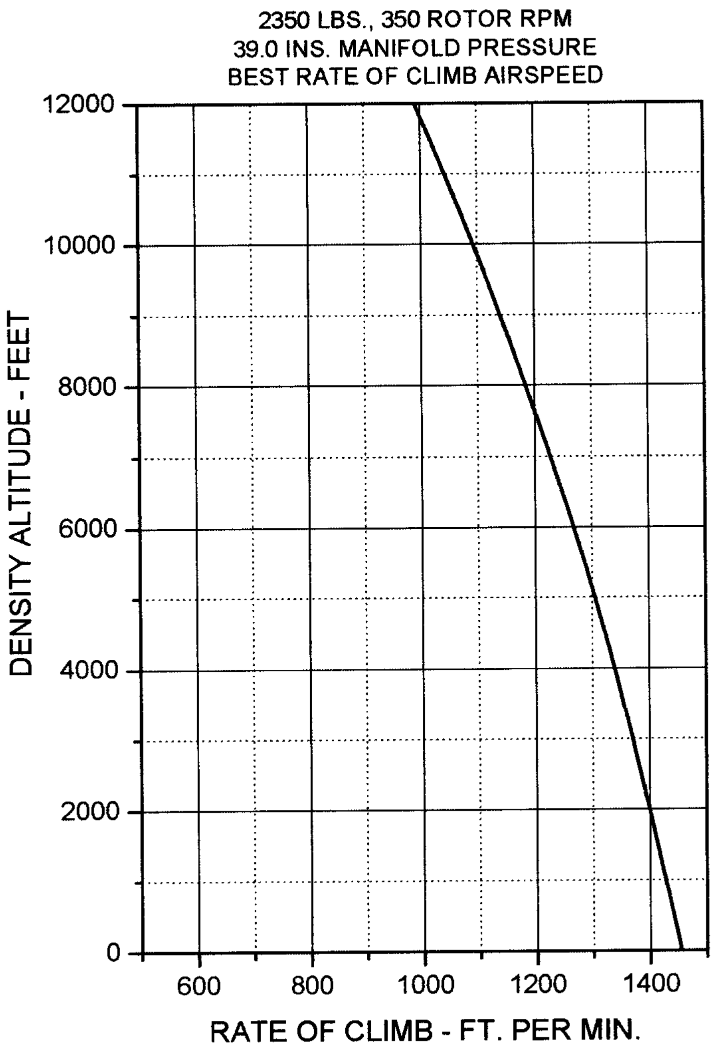

Figure 5-9. Best Rate of Climb Speed

Best rate of climb speed varies with altitude from 57 MPH IAS at SL decreasing to 48 MPH IAS at 12,000 ft H_d.

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SECTION 6. WEIGHT/BALANCE AND LOADING

6-1. General

This helicopter must be flown within the weight and center of gravity limits stated in Section 2, "Operating Limitations". The helicopter empty weight, empty weight c.g., total basic weight and basic weight c.g. are found in the Weight and C.G. Calculation form (Figure 6-8). Removal or installation of optional equipment will change the helicopter weight and c.g. These changes shall be recorded on the Weight and Balance form (Figure 6-7) to maintain a running basic total weight, arm, and moment. The pilot will use this running basic total when performing calculations to ensure the helicopter is loaded properly.

6-2. Approved Center of Gravity Envelopes

1. Longitudinal C.G.
   a. Station zero is located 100.0 inches forward of centerline of main rotor hub.
   b. Longitudinal c.g. range variable with gross weight from 92.0 inches to 100.0 inches (reference Figure 6-1).
2. Lateral Offset Moment
   a. Centerline of helicopter is 0 inch lateral moment arm. Looking forward, moment arms left of centerline are negative.
   b. Lateral c.g. locations:

Two people on board:	
(1) Left seat (pilot)	-13.5
(2) Right seat (co-pilot)	+13.5
Three people on board:	
(1) Left seat (pilot)	-13.5
(2) Center passenger	+3.0
(3) Right passenger	+20.5

3. Approved lateral offset moments vary with gross weight from -3250 in-lb to +3700 in-lb (reference Figure 6-2). Lateral offset is the same for all V_{NE} envelopes.

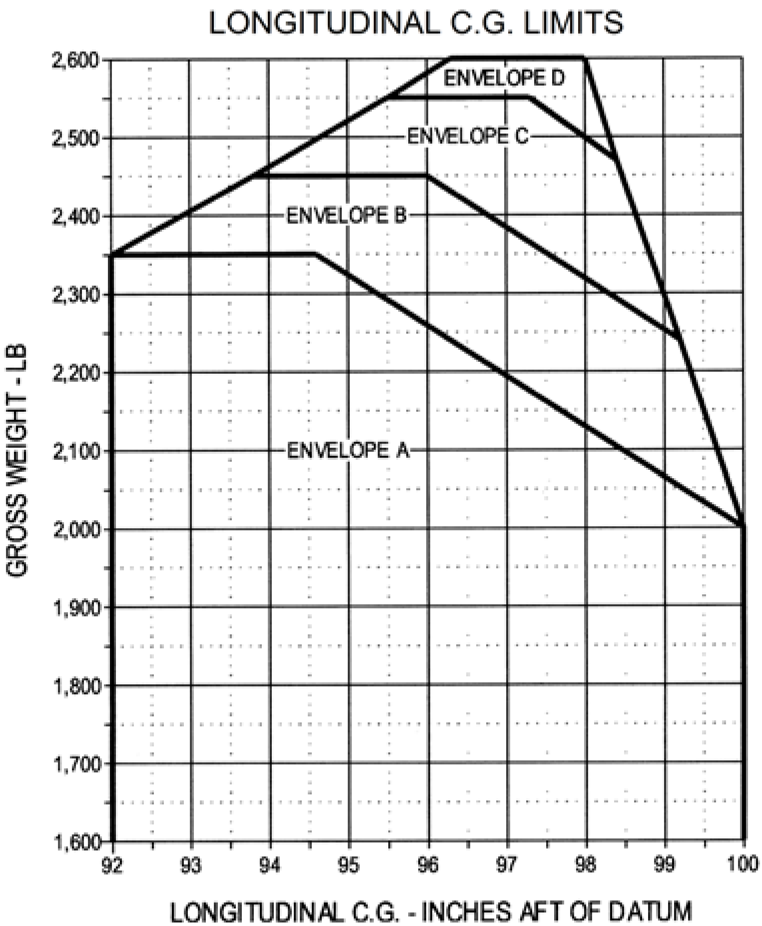

Figure 6-1. Longitudinal CG Envelopes

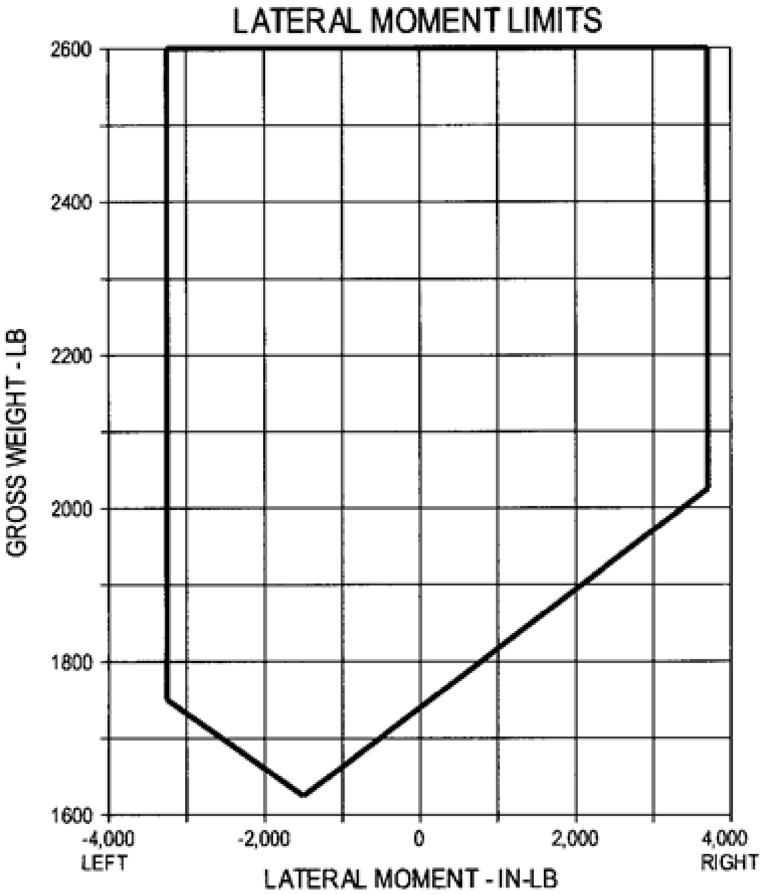

Figure 6-2. Lateral Offset Moment Envelope

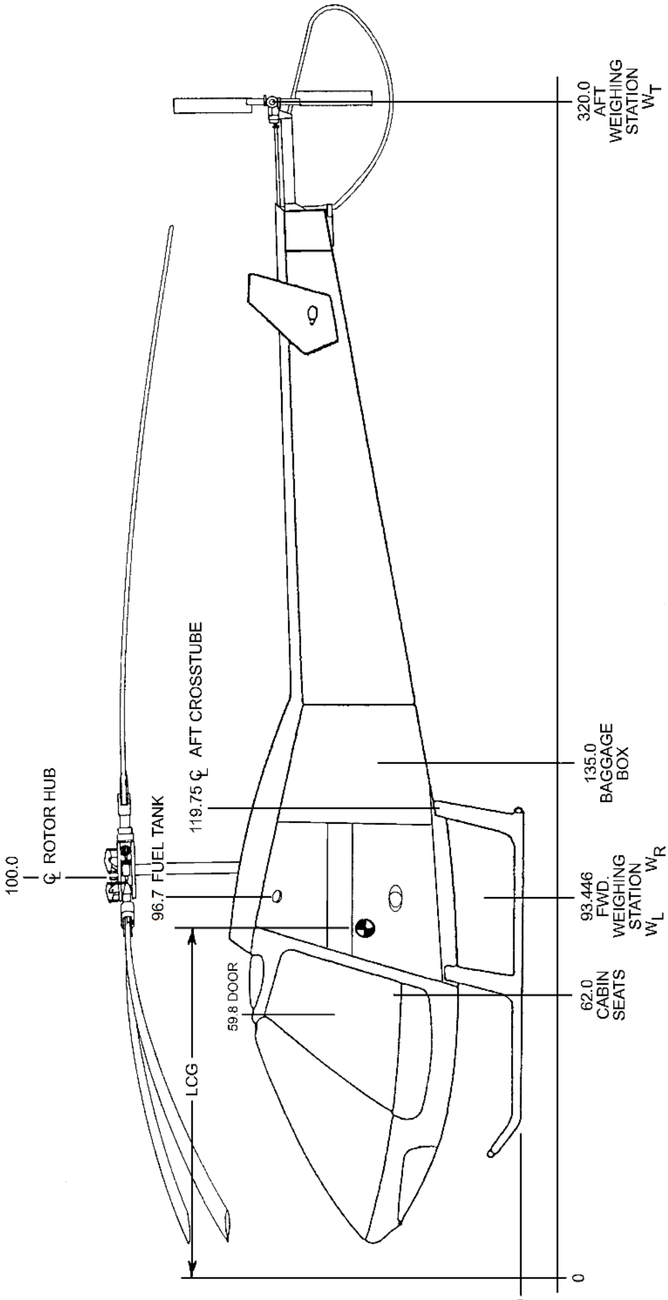

Figure 6-3. 280FX CG Diagram

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.

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.

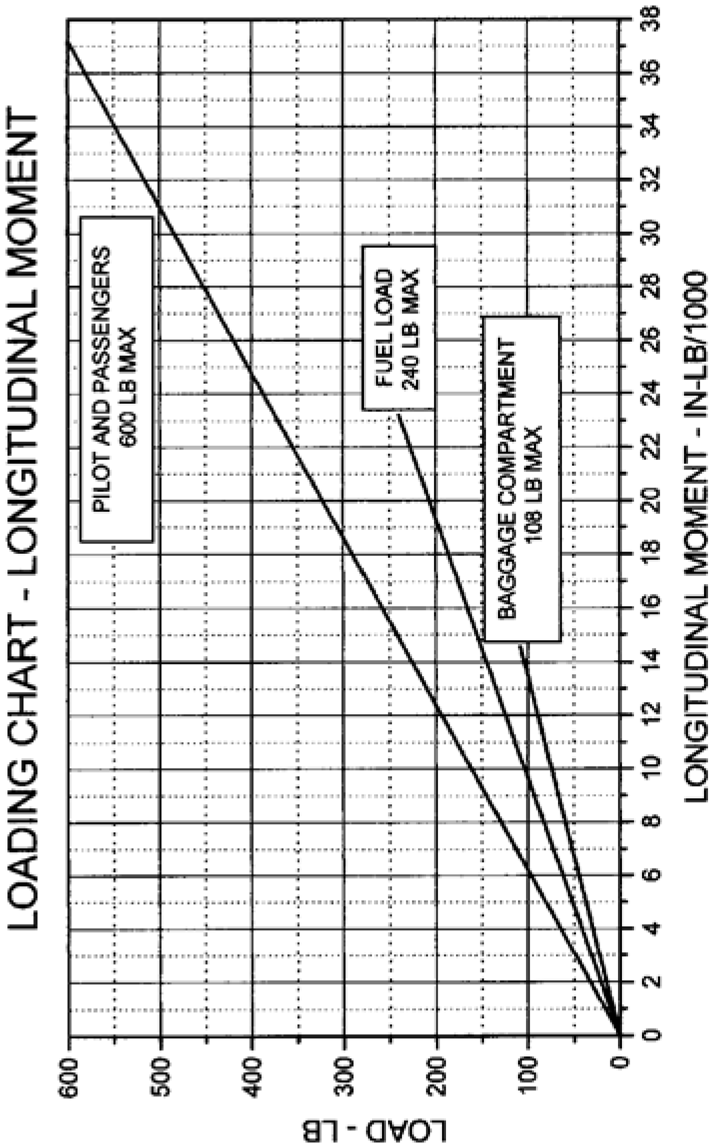

Figure 6-4. Loading Chart

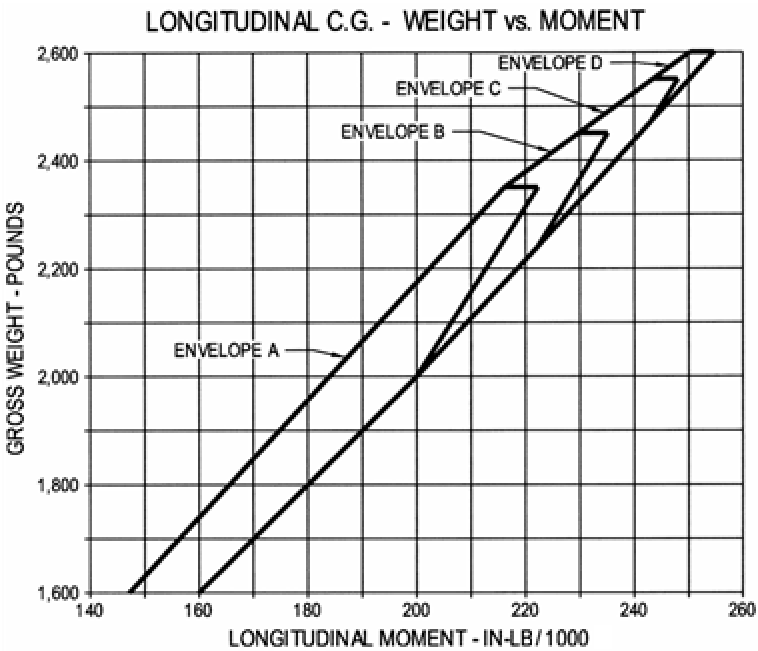

Figure 6-5. Gross Weight vs. Longitudinal Moment

NOTE

Figures 6-6 through 6-10 are an adaptation of Enstrom Form F-168A, which is used for current production aircraft as of the date of this revision. Refer to the actual weight and balance records for the aircraft.

Model	Serial No.	Reg No.	Date

WEIGHT POINT	SCALE-LB	TARE	NET. WT.	ARM	MOMENT x 100
LEFT GEAR	(W_L)	----		93.446	
RIGHT GEAR	(W_R)	----		93.446	
TAIL	(W_T)	X		320.0	
TOTAL	X X X	X		X	

$$LCG = \frac{W_T\,(320.0) + (W_L + W_R)(93.446)}{W_T + W_L + W_R} = \underline{\qquad\qquad} = \qquad \text{in.}$$

DATE

WEIGHED BY ______________________________

Figure 6-6. Weight Sheet

This form is the initial weight record of the aircraft. It lists the actual scale readings or indicates that the weight and balance is based on a standard computation for this aircraft. This form is the basis for the forms in Figures 6-7 and 6-8.

BASIC WEIGHT AND BALANCE RECORD

Model Serial No. Reg No. Date

ACTUAL DELIVERED WEIGHT AND BALANCE DATA								WEIGHT		ARM		MOMENT	
Item No.	Date	Item		Description or Modification	WEIGHT ADDED			WEIGHT REMOVED			RUNNING BASIC TOTAL		
		In	Out		Weight	Arm	Moment	Weight	Arm	Moment	Weight	Arm	Moment

Figure 6-7. Weight and Balance

This form provides a continuous history of the basic weight and moment resulting from structural and equipment changes. The last entry is the current weight and balance status of the basic helicopter.

Model	Serial No.	Reg No.	Date

		WEIGHT LB	ARM IN	MOMENT IN-LB
WEIGHT (AS WEIGHTED)				
PLUS: MISSING STD. EQUIPMENT - net			X	
LESS: OPT & SURPLUS WT. (next page)			X	
LESS: ENGINE OIL			100.0	
PLUS: UNUSABLE FUEL			96.7	
WEIGHT				
	ACTUAL			
PLUS: ENGINE OIL			100.0	
PLUS: OPTIONAL EQUIPMENT (next page)			X	

ITEMIZED MISSING STD. EQUIP:	WEIGHT LBS.	ARM IN.	MOMENT IN-LB.
A/C weighed as a 2 plc with dual controls, g/h wheels & operator's manual on the floor by console			
TOTAL BASIC WEIGHT & C.G.			

Figure 6-8. Weight and C.G. Calculation

This form is the basic delivered weight and balance form for the aircraft as delivered.

Model	Serial No.	Reg No.	Date

ENSTROM OPTIONAL EQUIPMENT LIST

INSTRUMENTS - REQUIRED (STD EQUIP)	Item Wt.	Arm STD Panel
Altimeter	1.2	36
Airspeed Indicator	.5	36
Tachometer	1.3	36
Manifold-Fuel Pressure	1.5	36
Instrument Cluster	2.0	36
Oil Temperature		
Oil Pressure		
Gearbox Temperature		
Cylinder Temperature		
Fuel Quantity		
Ammeter		
Compass	1.0	40
OAT (Note 1)	0.5	55
Engine Monitor	1.0	36
Annunciator	.04	32
Castleberry Attitude Gyro with Ball Inclonometer*	2.3	28
* Standard Equipment not required by FAA		

No.	OPTIONAL EQUIPMENT	WT.	ARM	MOMENT IN/LB
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Notes:

1. S/N 2146 and prior: OAT instrument is located overhead in the top of the cabin. S/N 2147 and subsequent: There is no overhead OAT instrument.

Figure 6-9. Equipment List

Figures 6-9 and 6-10 are the standard and optional equipment list.

Model	Serial No.	Reg No.	Date

16				
17				
18				
19				
20				
21				
22				
23				
24				
	TOTAL		X	

Figure 6-10. Equipment List – Continued

SECTION 7. AIRCRAFT AND SYSTEM DESCRIPTION

TABLE OF CONTENTS

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SECTION 7. AIRCRAFT AND SYSTEM DESCRIPTION

7-1. General

One of the first steps in obtaining the utmost performance and service from your 280FX is to familiarize yourself with its equipment, systems, and controls.

7-2. Interior Arrangement

The cabin interior is a full, three-place, side-by-side seating arrangement with a 58-inch width. The instrument panel is on the vertical plane for more natural scanning. Excellent visibility is offered through the tinted Plexiglas windshield, cabin doors, twin overhead and lower deck windows. Swing-open doors close securely with simple-to-operate safety lock handles. The helicopter can be flown with either left, right, or both doors removed.

7-3. Air Induction System

The air induction system consists of a filtered non-ram intake located within the engine compartment. It incorporates a spring-loaded, automatic alternate air source and spring-loaded backfire door.

7-4. Power Plant

A turbocharged Lycoming HIO-360-F1AD engine, rated at 225 HP, is used in this helicopter. The engine is a direct drive, four-cylinder, fuel injected, horizontally opposed, air cooled engine. Platinum spark plugs are supplied with the engine.

1. Oil System

   The Lycoming engine employs a wet sump lubrication system having a capacity of 8 quarts. The engine oil pump circulates the oil through two remote mounted oil coolers to provide cooling. One is located on the right-hand side of the engine compartment and the second cooler is located below the cooling fan. A thermostatic bypass and pressure relief valve are incorporated in the engine. Restricted pressure engine oil is also circulated through the turbocharger bearing housing. A separate engine scavenge pump returns the oil to the engine sump. A bayonet-type oil quantity gauge (dipstick) with graduated markings is part of the oil filler cap and is accessible through the left fuel drain access door.

The total oil system has a capacity of 10 quarts. This includes oil in the engine, oil filter, oil coolers, and oil lines. The markings on the dipstick correspond to the engine sump capacity (8 quarts) versus the total system capacity (10 quarts).

Standard type gauges are provided for both the engine oil temperature and oil pressure indications. Both gauges are marked to provide visual engine operating limitations and are located on the instrument panel.

2. Engine Controls

   a. Throttle. A twist grip-type throttle is located on the collective pitch control stick. The throttle is connected to a mechanical throttle correlation device which coordinates throttle control for changes in collective pitch settings. The throttle correlation linkage is connected to the fuel servo throttle valve on the engine. A round-head rivet mounted on the forward end of the twist grip is used for a start position index. A friction control for the rotating throttle is located just aft of the throttle grip. To increase the throttle friction, turn the friction control counter-clockwise. To decrease throttle friction, turn the friction control clockwise.

   b. Mixture Control. A vernier mixture control knob is provided on the instrument console. This vernier control incorporates the features of a standard push-pull cable. Full rich is in the "in" position. Full lean is in the "out" position. The vernier feature allows a screw type of adjustment to fine tune any preset mixture position.

   c. Magneto Switch. The magneto switch is a key-operated switch located on the left side of the switch 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.

7-8. Fuel System

The system consists of two interconnected 21 US gallon fuel tanks, which feed simultaneously to the engine. The tanks are located on the left and right side of the aircraft over the engine compartment. The tanks have a total fuel capacity of 42 US gallons, with a total of 2 gallons unusable fuel, one gallon unusable fuel in each tank. Each fuel tank is gravity fed to a central distributing line, which connects to the electric boost pump and engine-driven pump. The fuel control valve is an off-on type and is located on the firewall next to the pilot's right shoulder. Each tank has an individual drain valve in the bottom. There is also a main gascolator filter located aft of the firewall in the engine compartment. The drain valve control is on the right-hand side of the engine compartment and extends beyond the side panel.

1. Fuel Boost Pump Switch

   The fuel boost pump switch is located on the switch circuit breaker panel. The red fuel pressure warning light (LOW FUEL PRESS) is located on the annunciator panel and will illuminate at any time the fuel boost pump is shut off or fails to function properly.

2. Fuel Quantity Indicator

   The fuel quantity gauge continuously indicates the total quantity of fuel. It is hooked up through a float type transmitter located in the right-hand fuel tank.

NOTE

If there is a wiring fault in the fuel indictor system (open wire condition), the fuel quantity indicator will read full scale (beyond full).

3. Fuel Flow - Fuel Pressure Indicator

   The fuel pressure indicator provides pounds per hour and pressure readings of the fuel as delivered to the flow divider. The indicator is marked for normal operating range from 0 to 160 pounds per hour and 0 to 25 psi index lines in 5 psi increments.

7-9. Transmission System

The main transmission unit provides an RPM reduction between the engine and the main rotor. The transmission incorporates a freewheeling unit in the upper pulley assembly, which is mounted on the pinion input shaft. The freewheeling unit provides a disconnect from the engine in the event of a power failure and permits the main and tail rotors to rotate in order to accomplish safe autorotation landings. The main rotor transmission has a sight gauge that is located on the aft right-hand side and is visible through the top step kick-in panel on the right side of the helicopter.

A main rotor transmission temperature gauge is located on the instrument panel and is red-lined at 225°F.

The tail rotor transmission, mounted at the aft end of the tail cone, supports and drives the tail rotor. The tail rotor transmission is equipped with a self-contained lubricant supply and a visual lubricant level gauge at the rear of the housing.

Both transmissions are equipped with quick disconnect chip detectors which are connected to aviation yellow caution lights (MRGB CHIP and TRGB CHIP) in the annunciator panel.

7-10. Rotor System

1. Main Rotor

   The main rotor is a three-blade, fully articulated system. The fully articulated system in the 280FX helicopter is designed to provide smooth control responses in all modes of flight. Sufficient kinetic energy stored in the heavy rotor blades allows safe autorotation landings in the event of power failure. The rotor assembly consists of three all-metal bonded blades, upper and lower rotor hub plates, universal blocks, blade grip assemblies, and hydraulic lead-lag dampers.

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.

   The aft landing light is aimed downward for steep approaches and autorotations. Prior to S/N 2168, the aft light is mounted on the belly panel below the engine. On S/N 2168 and subsequent, the aft landing light is mounted on a removable access panel on the belly of the cabin. When on or near the ground, the aft landing light can cause glare from the ground and reflections in the cabin. This is significantly worse on aircraft with the aft light under the cabin (i.e. S/N 2168 and subsequent).

   On early production helicopters, the forward and aft landing 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.

7-17. Rotor RPM Warning System

The Rotor RPM Warning System uses a magnetic pick-up in the main rotor transmission to measure rotor RPM. A control unit activates a light and a warning horn when the main rotor RPM is below 334. This system is armed by the same switch that operates the clutch disengaged warning light. Neither the low rotor RPM light nor the warning horn will operate when the clutch is disengaged. A switch installed on the collective torque tube disarms the warning horn so that the light will operate, but the horn will not operate when the collective is on the down stop.

On aircraft S/N 2136 and subsequent, the Hi/Low Rotor RPM Warning System provides a visual and audio indication of low and high rotor RPMs. This system is essentially identical to the low rotor RPM warning system except it also indicates when the rotor RPM exceeds the upper limit. The activation points on this system are fixed and cannot be adjusted in the field. As with the low rotor RPM system, the horn is silenced when the collective is fully down. Thus, the horn will not sound if the RPM limit is exceeded during an autorotation with the collective fully down; the light will still illuminate.

Some earlier S/N aircraft may have been modified with the Hi/Low Rotor RPM Warning System.

7-18. Annunciator Panel

All of the warning and caution lights are contained in an annunciator panel, which is located at the top of the instrument panel. On early production helicopters, the warning lights include LOW ROTOR RPM, CLUTCH ENGAGE, and LOW FUEL PRESS; the caution lights include OVERBOOST, MRGB CHIP, and TRGB CHIP. On later production helicopters, STARTER RELAY is added to the warning lights and LOW VOLTAGE is added to the caution lights. Further information about these lights is contained elsewhere in this section and in Section 3, "Emergency and Malfunction Procedures".

For aircraft equipped with the Hi/Low Rotor RPM Warning System, ROTOR RPM replaces LOW ROTOR RPM in the annunciator panel.

CHAPTER 8. HANDLING, SERVICING, AND MAINTENANCE

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CHAPTER 8. HANDLING, SERVICING, AND MAINTENANCE

8-1. General

Title 14 of the Code of Federal Regulations (14 CFR) section (§) 91.403(a) places the primary responsibility of maintaining the helicopter in an airworthy condition on the owner or operator of the helicopter. The owner of the helicopter should register the helicopter with Enstrom Helicopter Corporation so they will receive the latest Service Directive Bulletins, Service Information Letters, and manual revisions. All procedures, limits, service, and maintenance requirements contained in this manual, the F-28F/280F Series Maintenance Manual, and Service Directive Bulletins are considered mandatory.

Registration of the helicopter in accordance with 14 CFR, Part 47 will ensure receipt of FAA Airworthiness Directives (AD). AD(s) are mandatory inspections or changes that must be completed within the time specified in the Directive.

8-2. Required Inspections

1. Regulatory Requirements

   All aircraft are required to undergo periodic inspections dependent on the regulations under which they are operating. Your maintenance facility can help you determine the required program. Owners and operators of exported helicopters should check with their own National Aviation Authority (NAA) to determine inspection requirements.

2. General

   Enstrom requires periodic inspections as outlined in the F-28F/280F Series Maintenance Manual.

   Reference Section 3 and Section 17 of the F-28F/280F Series Maintenance Manual for information on:

a. 50-hour inspections

b. 100-hour inspections

c. 200-hour inspections

d. Lubrication intervals

e. Special instructions

8-3. Maintenance

All maintenance, preventive maintenance and alterations to the helicopter must be performed in accordance with the Maintenance Manual procedures by appropriately rated personnel. All maintenance performed requires a log book entry in the helicopter log or the engine log. These documents need not be carried in the helicopter but must be available to mechanics performing maintenance and inspections.

8-4. Preventive Maintenance by the Pilot

14 CFR, Part 43, Appendix A (c), defines work classified as preventive maintenance. Preventive maintenance may be performed by a certified pilot on a helicopter he or she owns or operates. The work must be performed in accordance with the Maintenance Manual and logged in the helicopter or engine log.

NOTE

Owners and operators of exported helicopters should check with their own NAA to determine the scope of allowed "preventive maintenance".

8-5. Servicing

Servicing of the helicopter includes changing or replenishment of fuel, oil, lubrication, and other maintenance functions.

1. Fueling Locations

There are two fuel tanks located just aft of the cabin section and over the top of the engine. Each tank's capacity is 21 US gallons and is designed with a continuous cross feed so that fuel level remains the same in each tank. Observe the following precautions during servicing:

WARNING

Turn off all electrical switches. Disconnect external power, if used. Ground aircraft by attaching grounding cable to landing gear skids.

a. Fuel Capacity

Total quantity	42 US gallons
Usable quantity	40 US gallons
Grade	100/130, 100LL

NOTE

Refer to the latest revision of Lycoming Service Instruction No. 1070 for the latest information on alternate fuels.

b. Servicing Fuel System

The fuel filler caps are located on the top outboard of each fuel tank.

c. Filling Fuel System

To prevent moisture condensation, refuel aircraft as soon as possible using the following procedure:

WARNING

Use all necessary precautions to eliminate any fire hazard.

CAUTION

In many cases, it may be necessary to operate from fields lacking normal fuel servicing. When fueling from drums or any questionable source of supply, a clean funnel with a good screen or filter should be used to remove any foreign materials from the fuel.

(1) Attach ground wire to landing gear skids.

(2) Remove fuel cap and insert hose nozzle.

CAUTION

Do not allow nozzle to bend filler neck. This will help prevent bending the fiberglass fuel tanks.

NOTE

When refueling a hot engine, service the right tank, opposite the turbocharger exhaust first, allowing turbo exhaust to cool down prior to refueling the left tank.

NOTE

As cross-feeding is occurring during fueling, and to ensure full capacity of both tanks, it may be necessary to refill the right side tank, taking care not to overfill.

(3) Secure fuel caps and remove ground wire.

(4) Visually check all fuel lines and components for signs of leaks.

d. Draining Fuel System

Fuel draining should be accomplished with the helicopter in a nose-down attitude.

(1) Defuel through the filler neck, using a pump or siphon.

(2) Final draining must be accomplished using the fuel system drain valves.

(3) Be sure that drain valves are closed and secure after completing defueling of the aircraft.

2. Engine Oil System Locations

The engine has a wet sump lubrication system located on the bottom of the engine. Oil quantity is checked by the use of a dipstick located inside the left panel door just below the fuel tank. Oil is added to the engine through the adjacent tube, using an automotive-type filler spout. Lycoming recommends use of ashless dispersant oil at all times (Refer to the latest revision of Lycoming Service Instruction No. 1014) and recommends oil and filter changes at every 50 hours of operation, and more frequently if operated in dusty, dry climates.

a. Adding – Engine Oil System

(1) Visually check oil level on dipstick. Add oil (refer to Table 8-1) to bring level to the eight (8) quart (FULL) graduation mark.

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).

(2) Secure filler cap.

Table 8-1. Engine Oil Recommendations

TEMPERATURE	MIL-L-22851 OR SAEJ1899 ASHLESS DISPERSANT GRADE
All Temperature	SAE15W50 or SAE20W50
Above 80°F	SAE60
Above 60°F	SAE40 or SAE50
30°F to 90°F	SAE 30
0°F to 70°F	SAE30, SAE40, or SAE20W40
0°F to 90°F	SAE20W50 or SAE15W50
Below 10°F	SAE30 or SAE20W50

b. Draining – Engine Oil System

(1) Place suitable container under belly panel.

(2) Remove drain plug or open the drain valve and allow oil to drain.

(3) Disconnect a hose from the engine oil coolers and allow oil to drain.

NOTE

Engine oil should be warm, and a sufficient amount of time should be allowed for complete drainage of sump.

(4) Connect the hose after draining the oil.

(5) Reinstall the drain plug and safety wire or close the drain valve.

c. Replacement of Engine Oil Filter (P/N CH48103)

A spin-on type oil filter is located on the accessory housing. The filter should be replaced at each oil change. To replace the filter, follow the procedure below.

(1) Remove seat back and seat deck panel.

(2) Remove firewall panel located behind pilot seat.

(3) Remove and discard safety wire.

(4) Using a 1-inch socket, remove filter.

(5) Replace with new filter, lubricating seal with oil.

(6) Torque to 18-20 ft-lb and safety with .032" safety wire.

(h) Cut open filter and inspect for excessive metal. If metal is present, contact a qualified aircraft mechanic for advice.

d. Draining – Engine Oil Coolers

(1) Refer to para. 8-5, step 2.b.(3) to drain the engine oil coolers.

e. Servicing Engine Oil System

1) Ensure oil filter is installed, engine sump drain plug is installed or drain valve closed, and engine oil cooler drain hoses are installed.

(2) Add 8 quarts of oil to the engine sump (refer to Table 8-1).

NOTE

Two (2) additional quarts of oil will be required after the initial ground run because of the oil filter, oil coolers, and lines in the lubrication system.

(3) Secure filler cap and dipstick.

(4) Check all oil lines and components for evidence of leaks during ground run.

(5) After ground run, add oil to "FULL" mark.

3. Battery Information

The battery stores electrical energy produced by the aircraft alternator and supplies current to the electrical system on demand. The aircraft uses either a 12-volt or a 24-volt battery. The 12-volt battery on early production helicopters is located under the seat deck panel on the extreme right side of the seat deck. The 24-volt battery and 12-volt battery on later production helicopters is located immediately aft of the aft cross tube on the right hand side of the aircraft. The battery is set in a box and secured by a hold-down bracket. Later production aircraft are equipped with a sealed battery that eliminates the electrolyte servicing requirements. Early production aircraft might have the sealed battery installed as a replacement unit.

a. Electrolyte Spillage

Overfilling and overcharging are two common causes of electrolyte spillage. To preclude corrosion due to battery acid spillage, these simple servicing precautions should be performed.

(1) Maintain the proper electrolyte level.

(2) Visually inspect battery for cracks, spillage, corrosion, and security of mounting.

(3) Visually inspect adjacent structures for evidence of corrosion or spilled electrolyte.

CAUTION

In the event that the battery charge is low and an auxiliary/ground power unit connector is not installed on the aircraft, use care when connecting automotive jumper cables. Burn damage to the battery cables will require replacement.

b. Battery – Servicing

Refer to the battery manufacturer's instructions for servicing the battery.

CAUTION

To clean spilled electrolyte off battery, mix one part baking soda to three parts water. <u>DO NOT</u> allow solution to enter battery cells. Rinse with clear water and wipe off with clean cloth.

4. Main Transmission Location

The main transmission is located aft of the cabin section, mounted on the pylon above the engine. Power is transmitted to the main and tail rotor assemblies. Oil level is checked by a sight gauge located on the right, aft side of the transmission. The top step kick-in panel on the right side of the helicopter can be opened for the inspection. With the helicopter in a relatively level position, the oil level should be at or near the halfway level in the sight gauge.

The main rotor transmission oil capacity is 6 pints. When the oil is drained from the transmission, only 5.5 pints of oil are required for servicing the transmission. Refer to Table 8-2 for the approved oils for servicing the main rotor transmission.

Table 8-2. Approved Main 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 – Main Transmission

A magnetic chip detector is located on the bottom of the transmission on the left aft corner. The unit itself 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).

The following procedures are to be used in draining the transmission.

(1) Remove and inspect the magnetic chip detector for evidence of metal - do not disconnect the wire lead; tie back out of the way.

(2) Install a trough-type device under the base fitting of the chip detector, outward to the left side of the aircraft.

(3) Place a suitable container under the trough to catch the oil.

(4) Remove the base fitting, allowing oil to drain.

NOTE

Allow ample time for complete drainage.

(5) Discard and replace base fitting crush washer.

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.

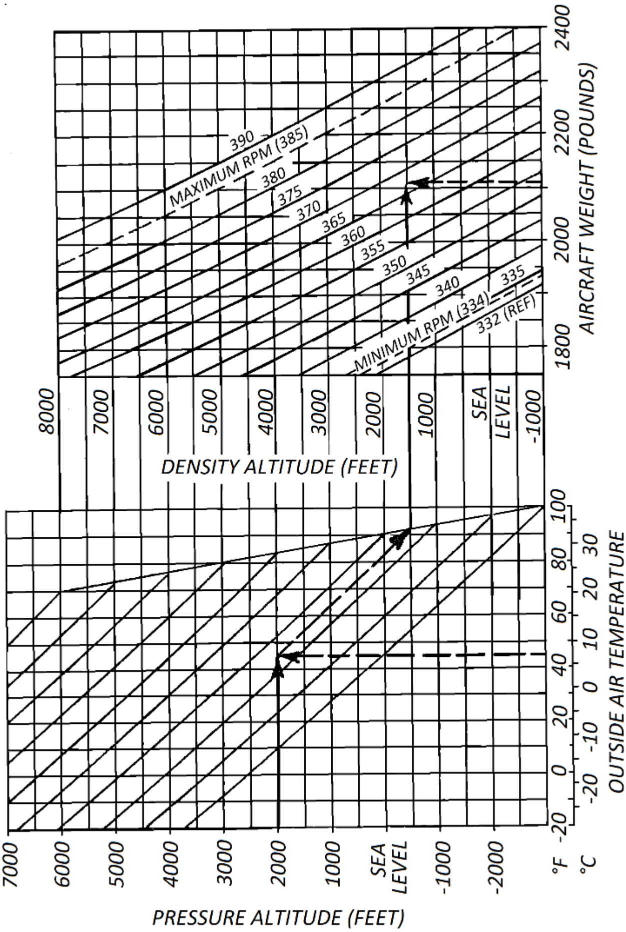

Figure 8-1. Autorotation RPM Schedule for Sea Level Base Altitude

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.

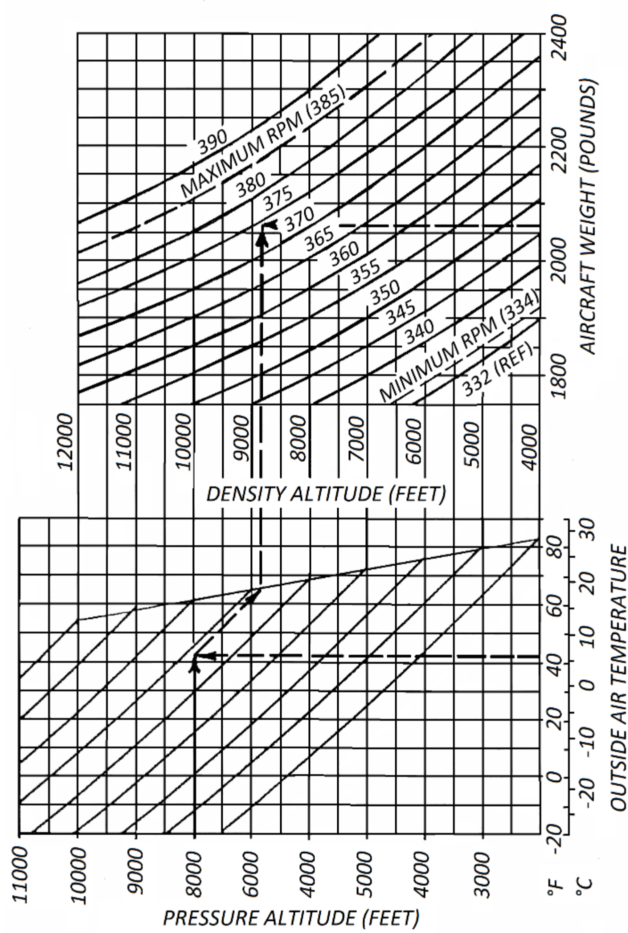

Figure 8-2. Autorotation RPM Schedule for 6000 Ft Base Altitude

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. OPERATIONAL INFORMATION

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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.

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.

SECTION 10

OPTIONAL EQUIPMENT SUPPLEMENTS

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SECTION 10

SUPPLEMENT 1
WET/DRY DISPERSAL SYSTEM

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SECTION 10

SUPPLEMENT 1

WET/DRY DISPERSAL SYSTEM

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SUPPLEMENT 1

WET/DRY DISPERSAL SYSTEM

SECTION I. GENERAL

10-1-1. Introduction

1. This supplement must be attached to the approved flight manual when the wet/dry dispersal system is installed. Operation in compliance with Section 2 of the approved Flight Manual is mandatory except as modified by this flight manual supplement. Other approved sections and supplemental data are recommended procedures.

2. This aircraft is approved for restricted category operations when agricultural spray equipment is installed in compliance with Enstrom Helicopter Drawing 28-22620. (Initial installation of electrical components, pump, clutch control, rails, drive system, boom attach fittings and upper tank attach fittings must be performed by a certified mechanic and entered in the air frame log). After initial installation, removal or installation of wet/dry dispersal system may be accomplished by owner or operator.

SECTION II. OPERATING LIMITATIONS

10-1-2. Airspeed Limitations

Maximum operation speed 85 MPH IAS at sea level density altitude (DA), power on and power off, linear decrease to 80 MPH IAS at 6000 ft DA, linear increase to 57 MPH IAS at 9000 ft DA.

10-1-3. Altitude Limitations

1. 9000 ft density altitude

10-1-4. Weight Limitations

1. Maximum gross weight: 2600 lb

2. Maximum load per dispersal tank: 350 lb

10-1-5. Center of gravity limitations

1. 96.3 inches to 98 inches at 2600 lb

2. For weights lower than 2600 lb, reference Figure 10-1-6.

10-1-6. Type of Operation

1. Approved for restricted category operations under provisions of Title 14 CFR, Part 137.

10-1-7. Placards

1. On Tank:

RESTRICTED AGRICULTURAL OPERATION ONLY MAX. LOAD PER DISPERSAL TANK – 350 LB

2. In View of Pilot:

   a. The following V_{NE} placard is used on all 280FX helicopters serial number 2132 and prior.

RESTRICTED CATEGORY - NEVER EXCEED SPEEDS M.P.H. I.A.S.

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F						
	-20	0	20	40	60	80	100
SEA LEVEL	85	85	85	85	85	85	85
1000	85	85	85	85	85	83	82
2000	85	85	85	84	83	82	81
3000	85	85	84	83	82	81	80
4000	85	84	83	82	81	80	69
5000	84	83	82	81	80	68	57
6000	83	82	81	80	68	60	
7000	82	81	79	68	60		
8000	81	80	69	61			
9000	80	72	59				

28-22615
"F" MODELS

b. The following V_{NE} placard is used on all 280FX helicopters serial number 2133 and subsequent. 280FX helicopters serial number 2132 and prior may also use the following placard.

RESTRICTED CATEGORY - NEVER EXCEED SPEEDS M.P.H. I.A.S.

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F							
	-20	0	20	40	60	80	100	120
SEA LEVEL	85	85	85	85	85	85	85	85
1000	85	85	85	85	85	83	82	81
2000	85	85	85	84	83	82	81	80
3000	85	85	84	83	82	81	80	79
4000	85	84	83	82	81	80	69	58
5000	84	83	82	81	80	68	57	
6000	83	82	81	80	68	60		
7000	82	81	79	68	60			
8000	81	80	69	61				
9000	80	72	59					

28-22615-13
"F" MODELS

SECTION 3. EMERGENCY AND MALFUNCTION PROCEDURES

10-1-8. Liquid Jettison

Jettison liquid by actuating dump valve switch on cyclic stick. A slight pitch up can be anticipated. Adjust cyclic control accordingly.

NOTE

Jettison tests were performed with one dump valve inoperative to produce maximum lateral load and the demonstration showed negligible effect on lateral control.

10-1-9. Loss of Power

Enter autorotation, jettison load immediately and follow normal flight manual procedures.

10-1-10. Loss of Tail Rotor

Enter autorotation, jettison load immediately and follow normal flight manual procedures.

10-1-11. Abnormal Vibration

In the event of sudden onset of a severe 1/rev. vibration, jettison load immediately and land helicopter. Check and or repair M/R dampers as appropriate before further flights.

10-1-12. Spreader Malfunction

If increasing cyclic displacement is required for hover or forward flight, land immediately and check loading situation and spreader operation.

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SECTION IV. NORMAL PROCEDURES

10-1-13. Preflight Check

1. Check sprayer system controls. Clutch control handle and spray "on" and "off" switch on cyclic stick.
2. Check spray tank booms for security.
3. Check spray tank for security and freedom of movement against springs.
4. Check security of pump belts and mounting hardware.

10-1-14. Pre-Take-Off

1. Before take-off, lift guard on emergency dump switch.

10-1-15. Hover Check

1. Hover check system at G.W. for proper damper operation.

SECTION V. PERFORMANCE

RESTRICTED CATEGORY

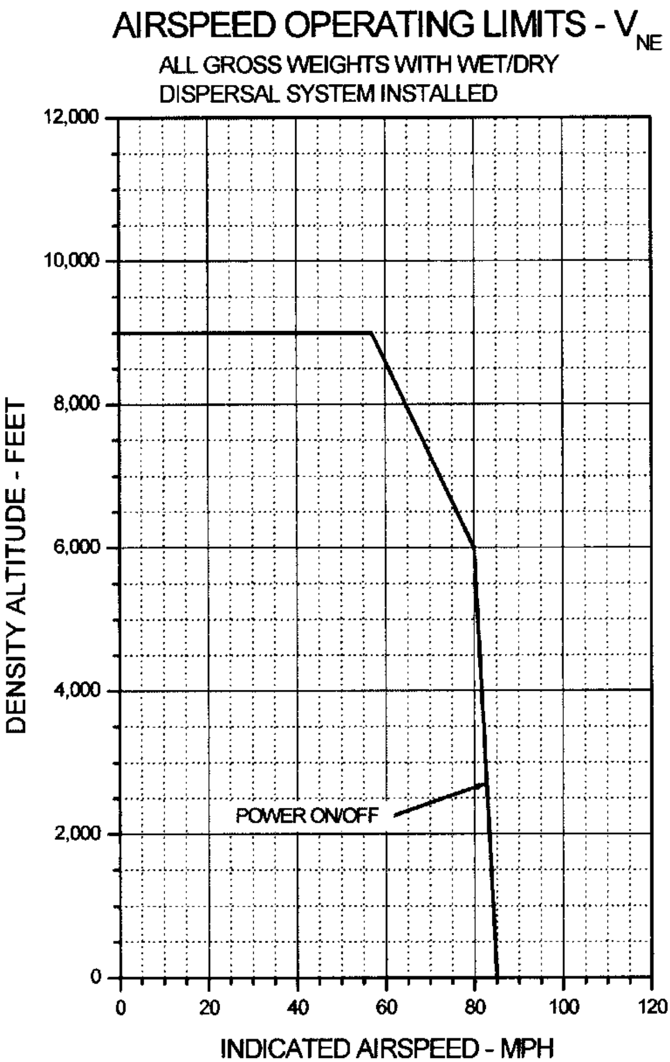

Figure 10-1-1. V_{NE} vs. Density Altitude

V_{NE} Demonstrated at 334 Rotor RPM

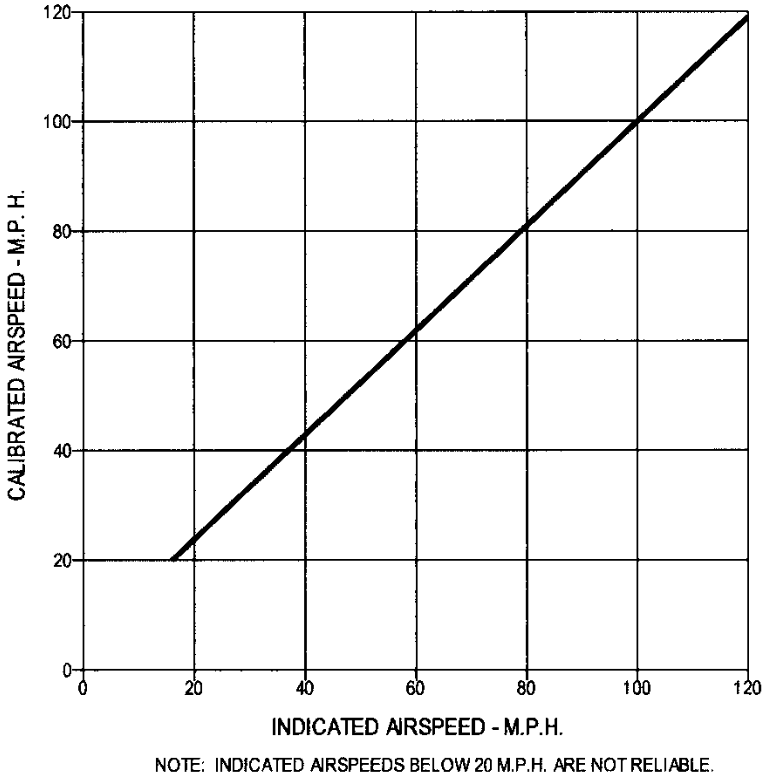

Figure 10-1-2. Airspeed Calibration

2600 lb Gross Weight

AG Tanks and Booms

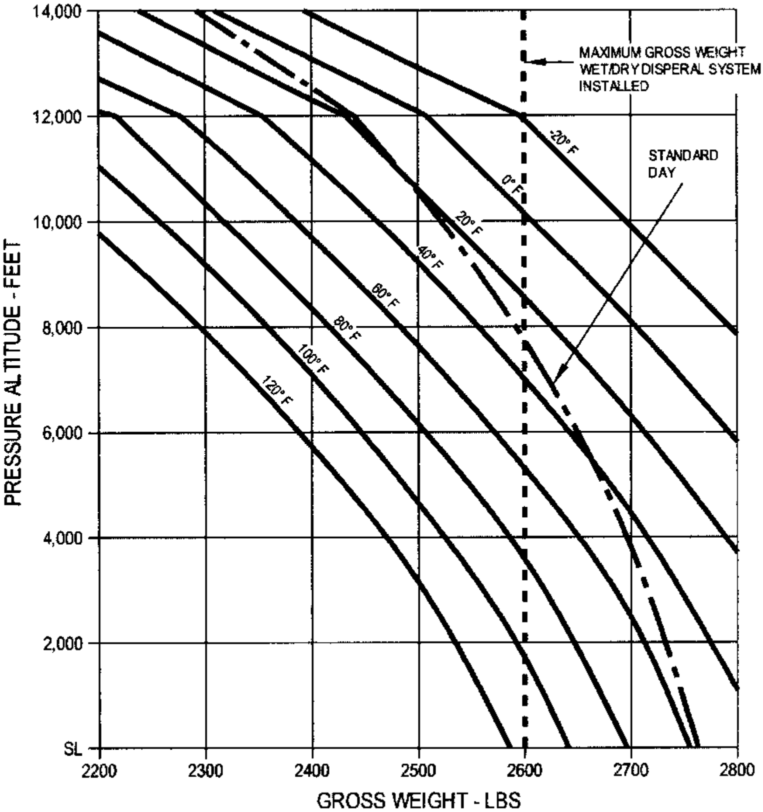

Figure 10-1-3. Hover Ceiling In-Ground Effect

2 ft Skid Height

350 Rotor RPM

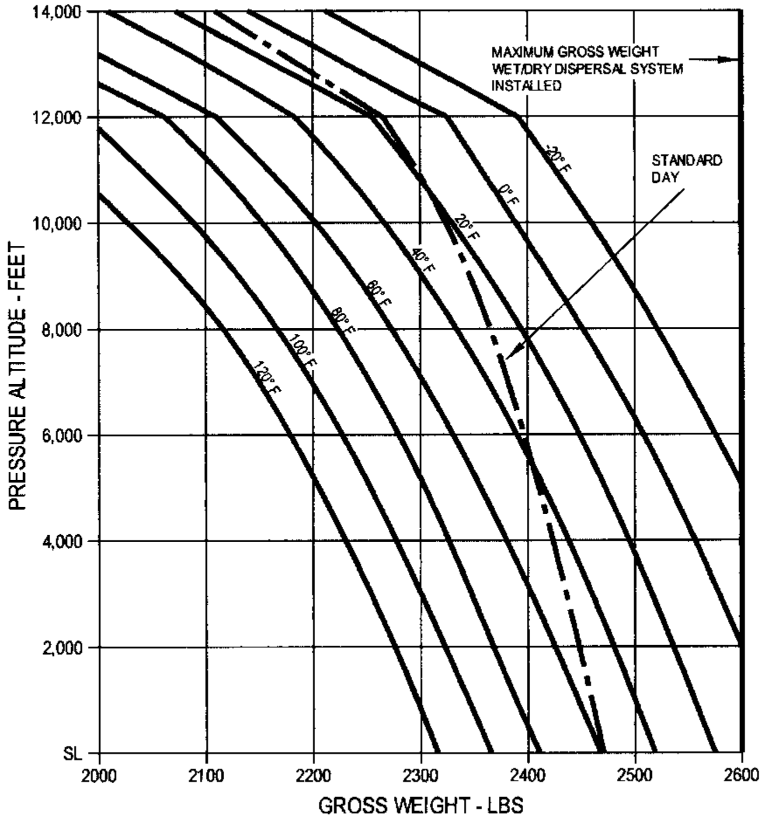

Figure 10-1-4. Hover Ceiling Out-of-Ground Effect

40 ft Skid Height

350 Rotor RPM

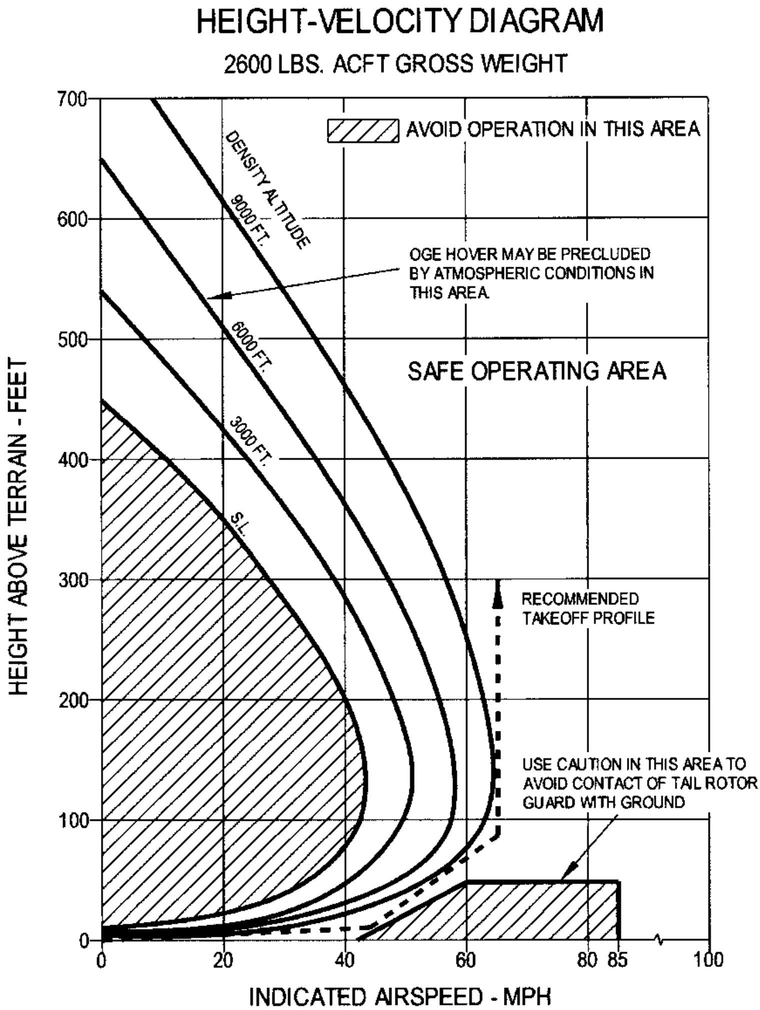

Figure 10-1-5. Height Velocity Diagram

Tests conducted on prepared surfaces with internal ballast and without spray booms at SL and 7000 ft density altitude.

SECTION VI. WEIGHT AND BALANCE

A new weight and balance should be calculated per the instructions in Section 6 of the Basic Rotorcraft Flight Manual using the following information:

Table 10-1-1. Weight and Balance Information

ITEMS INSTALLED	WEIGHT (lb)	ARM (in)	MOMENT (in-lb)
Wet system – removable portion	113.65	107.77	12,247.59
Dry system – removable portion	71.35	97.60	6,963.47
Items remaining on helicopter (Normal category)	13.25	89.94	1,191.12
Dispersal tank load		95.0	

ITEMS REMOVED	WEIGHT (lb)	ARM (in)	MOMENT (in-lb)
Land gear fairings	-8.0	96.75	-774.00

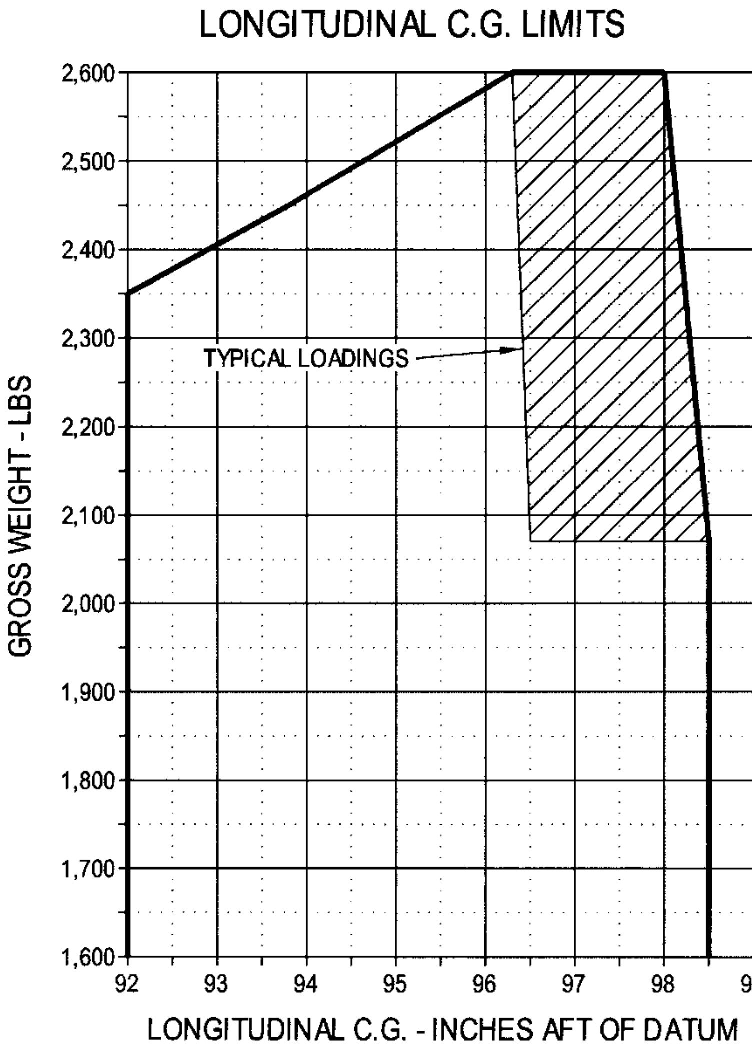

Figure 10-1-6. Gross Weight vs. Longitudinal C.G.

SECTION VII. INSTALLATION INSTRUCTIONS

10-1-16. Initial Installation

Refer to Enstrom drawing 28-22620 and handbook "Installation Instructions and Parts List Combination Wet/Dry Ag Kit 831000".

10-1-17. Dispersal System Items

The following dispersal system items may remain on the helicopter for normal category operations.

1. Rail assembly
2. Power take-off assembly
3. Strut fittings and upper tank fittings
4. Pressure gage
5. Clutch control
6. Electrical harness and switches

10-1-18. Installation Procedures Wet Dispersal System

1. Position tanks on rails and secure with (4) clevis pins (upper and lower).

NOTE

Check internal tank mounting. Isolation mount spring should be in free state (no preload with tank empty). Check nut should be 1.0 inch in from end of threaded rod.

2. Position wet center section on rails and secure with clevis pins.
3. Attach cross feed assembly to spray tanks, secure with over center latch and safety wire, and install two (2) hoses to center section.

4. Attach clutch control cable.

5. Remove tape securing belt to jack strut and place belt on power take off.

6. Connect pressure sender, valve, motor and emergency dump motor electrical plugs.

7. Attach spray booms and safety.

8. Inspect system and perform operational check.

9. Make log book entry: "Wet dispersal system installed. Helicopter approved for restricted category operations only".

10-1-19. Wet System Removal

1. Reverse steps 1 through 9.

10-1-20. Installation Procedures Dry Dispersal System

1. Position tanks on rails and secure with four (4) clevis pins.

NOTE

Check internal tank mounting. Isolation mount spring should be in free state (no preload with tank empty). Check nut should be 1.0 inch in from end of threaded rod.

2. Install right side spreader under tank and secure with overcenter latch (butterfly valve aft) and safety wire. Connect electrical plug to valve motor.

3. Install left spreader under tank.

4. Install and adjust linkage between butterfly valves.

5. Install angle drive using two (2) clevis pins and safety.

6. Install "V" belt and adjust tension.

7. Install left and right take-up assemblies.

8. Install long "V" belt to each spreader (lower to right spreader) and adjust tension.

9. Inspect system and perform operational check.

10. Make log book entry: "Dry dispersal system installed; helicopter approved for restricted category operations only".

10-1-21. Dry System Removal

1. Reverse steps 1 through 10.

10-1-22. To Return Helicopter to Normal Category

1. Remove wet or dry dispersal system per above instructions.

2. Cap electrical plugs, fasten ends to rail or cross tube with tape or bundle ties.

3. Fasten clutch cable to cross tube.

4. Tape "V" belt to jackstrut.

5. Inspect helicopter.

NOTE

Possible deterioration of rubber parts and corrosion of helicopter structure may occur when certain dispersants are used. Inspection intervals and cleaning procedures should be modified to prevent damage.

6. Make log book entry: "Wet/Dry dispersal system removed except for allowed provisions remaining on helicopter. Helicopter approved for normal category operations".

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SECTION 10

SUPPLEMENT 2

FLOAT LANDING GEAR

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SUPPLEMENT 2

FLOAT LANDING GEAR

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SUPPLEMENT 2

FLOAT LANDING GEAR

SECTION I. GENERAL

10-2-1. Introduction

This supplement must be attached to the Approved Rotorcraft Flight Manual when the Enstrom Float Landing Gear Kit No. 28-17326-4 is installed. Operation in compliance with Section 2, "Operating Limitations", of the basic manual is mandatory except as modified by this supplement. Other approved sections and supplemental data are recommended procedures.

10-2-2. Description

The 28-17326-4 Float Landing Gear Kit consists of two multi-cell (five compartment) Air Cruisers No. D 24780 inflatable floats, attachment fittings, relocated pitot tube, and lengthened landing gear universal blocks.

SECTION II. OPERATING LIMITATIONS

10-2-3. Type of Operations

Normal operations from water at night are prohibited. This helicopter is approved for operation under day-night VFR non-icing conditions from land, and for day VFR non-icing conditions from water.

10-2-4. Airspeed Limitations

1. Never Exceed Speeds
   a. Envelope A V_{NE} 100 MPH IAS from sea level (SL) density altitude (DA) to 3000 ft DA. For variations greater than 3000 ft DA, refer to the placards in 10-2-7 and Figure 10-2-1.
   b. Envelope B V_{NE} 94 MPH IAS from SL to 3000 ft DA. Refer to placard and Figure 10-2-1 for variations with altitude.
   c. Envelope D V_{NE} 85 MPH IAS at SL DA. Refer to placard and Figure 10-2-1 for variations with altitude.

NOTE

For float operations, envelopes C and D have been combined.

10-2-5. Altitude Limitations

1. No change from Basic Rotorcraft Flight Manual, except as described in Paragraph 10-2-13 of this Supplement, Base Altitude Change.

10-2-6. Center of Gravity Limitations

1. Reference Paragraph 10-2-15 of this Supplement for approved c.g. limits and lateral offset moment.

10-2-7. Placards

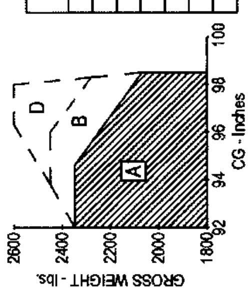
1. V_{NE} placards (located overhead above center windshield):

   a. The following V_{NE} placards are used on all 280FX helicopters serial number 2132 and prior.

A

V_{NE} - IAS (MPH) FOR ENVELOPE 'A' WITH FLOATS

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F -20	0	20	40	60	80	100
SEA LEVEL	100	100	100	100	100	100	100
2000	100	100	100	100	100	97	93
4000	100	100	100	97	93	88	82
6000	100	98	94	88	82	75	68
8000	95	90	82	75	68	62	55
10,000	84	77	69	62	55		
12,000	70	63	55				



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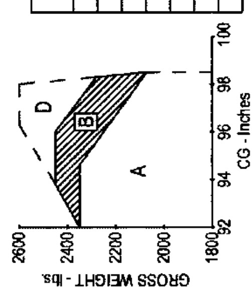
B

V_{NE} - IAS (MPH) FOR ENVELOPE 'B' WITH FLOATS

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F -20	0	20	40	60	80	100
SEA LEVEL	94	94	94	94	94	94	94
2000	94	94	94	94	94	92	89
4000	94	94	94	92	89	85	77
6000	94	93	89	85	77	70	63
8000	90	86	78	70	62		
10,000	80	71	63	56			
10,800	74	65	59				



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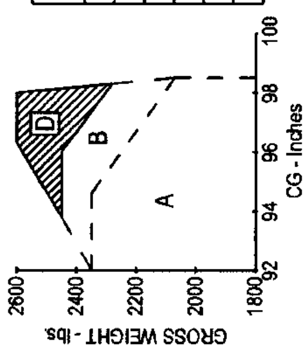
V_{NE} - IAS (MPH) FOR ENVELOPE 'D' WITH FLOATS

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F -20	0	20	40	60	80	100
SEA LEVEL	85	85	85	85	85	84	83
2000	85	85	85	84	83	82	81
4000	85	84	83	82	81	78	69
6000	83	82	81	79	69	59	
8000	81	80	70	60			
9000	80	71	60				



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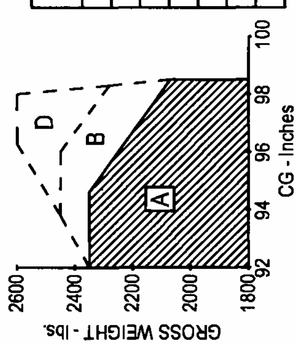
D

b. The following V_{NE} placards are used on all 280FX helicopters serial number 2133 and subsequent. 280FX helicopters serial number 2132 and prior may also use the following placards.

A

V_{NE} - IAS (MPH) FOR ENVELOPE 'A' WITH FLOATS

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F							
	-20	0	20	40	60	80	100	120
SEA LEVEL	100	100	100	100	100	100	100	100
2000	100	100	100	100	100	97	93	89
4000	100	100	100	97	93	88	82	76
6000	100	98	94	88	82	75	68	61
8000	95	90	82	75	68	62	55	
10,000	84	77	69	62	55			
12,000	70	63	55					



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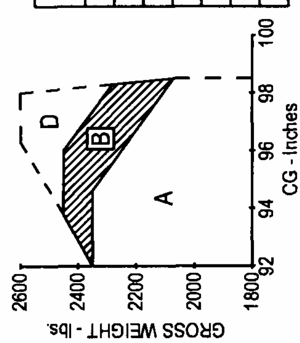
B

V_{NE} - IAS (MPH) FOR ENVELOPE 'B' WITH FLOATS

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F							
	-20	0	20	40	60	80	100	120
SEA LEVEL	94	94	94	94	94	94	94	94
2000	94	94	94	94	94	92	89	86
4000	94	94	94	92	89	85	77	69
6000	94	93	89	85	77	70	63	56
8000	90	86	78	70	62			
10,000	80	71	63	56				
10,800	74	65	59					



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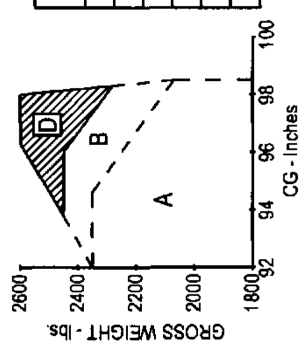

V_{NE} - IAS (MPH) FOR ENVELOPE 'D' WITH FLOATS

PRESSURE ALTITUDE	OUTSIDE AIR TEMPERATURE °F							
	-20	0	20	40	60	80	100	120
SEA LEVEL	85	85	85	85	85	84	83	82
2000	85	85	85	84	83	82	81	80
4000	85	84	83	82	81	78	69	60
6000	83	82	81	79	69	59		
8000	81	80	70	60				
9000	80	71	60					

28-180057-13

D

SECTION 3. EMERGENCY AND MALFUNCTION PROCEDURES

10-2-8. Engine Failure During Flight (Above 80 MPH)

1. Maintain heading with antitorque pedals and apply aft cyclic to reduce airspeed while simultaneously lowering collective pitch.

2. Stabilize at 58 MPH.

NOTE

Night operation – Turn on landing light.

3. At about 75 ft above ground/or water, apply aft cyclic to reduce forward speed.

4. When about 20-25 ft above surface, begin to level helicopter and apply collective pitch as necessary to cushion a level landing.

WARNING

Touchdown speeds should be kept below 20 MPH for emergency autorotating water landings, especially with forward c.g.

10-2-9. Engine Failure During Flight (Below 80 MPH)

1. Enter normal autorotation and stabilize at 58 MPH.

NOTE

Night operation – Turn on landing light.

2. Use same procedure as steps 3 and 4 of above procedure.

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SECTION IV. NORMAL PROCEDURES

10-2-10. Rotor Engagement (On Water)

Prior to engaging the rotor, the helicopter should either be secured or set adrift in an area sufficient to make at least one rotation due to engagement rotor torque. Allowance should be given for helicopter drift.

Apply full left pedal and then follow normal engagement procedures until needles marry, then smoothly advance throttle until tail rotor becomes effective.

10-2-11. Flight Information

Taxi at slow speeds with partial collective to prevent float bows from nosing under. Safe taxiing has been demonstrated in waves up to 18 inches (trough to crest).

10-2-12. Running Landing

1. Maximum recommended water contact speed is 30 MPH. Reduce speed on rough water.

2. After water contact, avoid rapid lowering of collective pitch.

NOTE

To avoid possible float damage on land, use minimum ground contact speed.

10-2-13. Base Altitude Change

Before flight, check float pressure. Normal pressure is 1.5 psig.

1. For flights to lower altitude: Over-inflate at base altitude 0.5 psig per 1000 ft anticipated altitude change (6.5 psig maximum inflation pressure).

NOTE

This includes the normal ambient temperature variations associated with changes in altitude.

2. For flights to higher altitude – 10,000 ft differential altitude permitted (provided float pressure is not more than 1.5 psig at takeoff).

3. For variations in ambient air temperature and/or water temperature at a given base altitude use the following procedure. When an ambient air temperature or water temperature colder than the temperature at initial inflation is anticipated, over inflate, 0.5 psig above normal for each 15°F decrease in temperature anticipated.

SECTION V. PERFORMANCE

10-2-14. General

No change from Basic Rotorcraft Flight Manual except as indicated in the following charts:

1. Figure 10-2-1: V_{NE} vs. Density Altitude

2. Figure 10-2-2: Airspeed Calibration

10-2-15. Rate of Climb

Reduce rate of climb by 150 feet per minute from that obtained from Figure 5-9 of the Basic Rotorcraft Flight Manual.

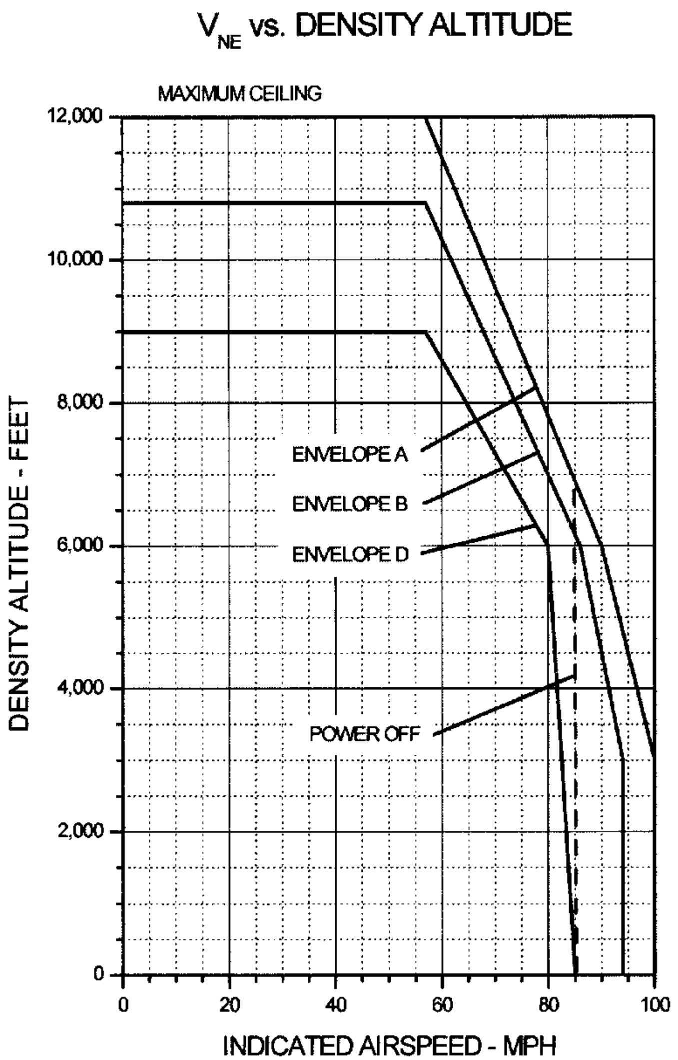

Figure 10-2-1. V_{NE} vs. Density Altitude

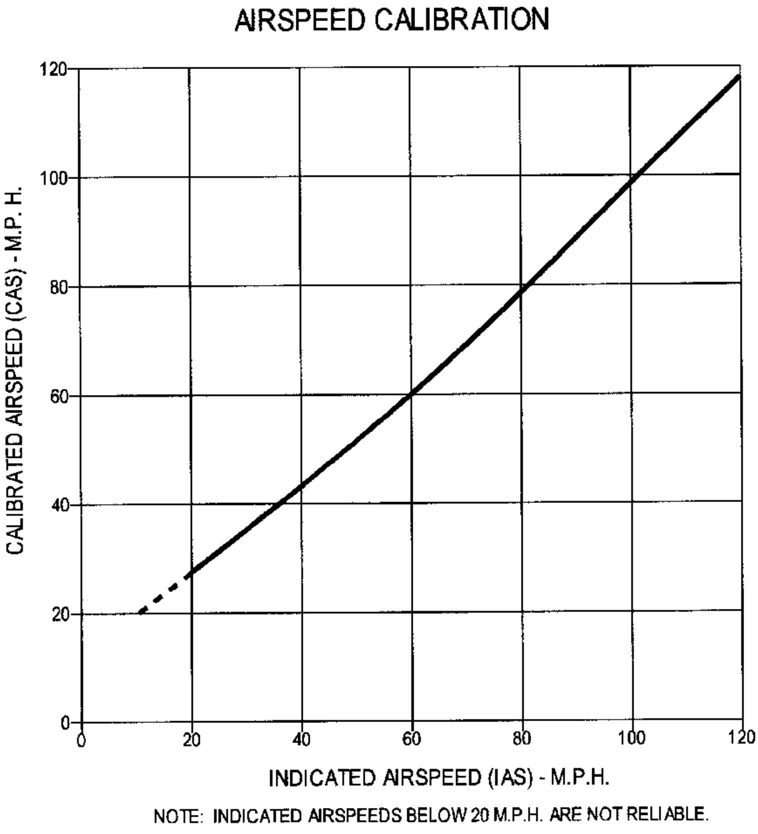

Figure 10-2-2. Airspeed Calibration Curve w/Float Pitot System

Pitot Tube Installed in Nose

(Assumes Zero Instrument Error)

SECTION VI. WEIGHT AND BALANCE

10-2-16. General

A new weight and balance should be calculated per the instructions in Section 6 of the Basic Rotorcraft Flight Manual using the following information:

Table 10-2-1. Weight and Balance Information

ITEM	WEIGHT (lb)	ARM (in)	MOMENT (in-lb)
Float landing gear	75.0	107	8025
Wheel and bracket removal	-15.0	104.7	-1703

10-2-17. Center of Gravity Limits

1. There are three gross weight/c.g. envelopes for this helicopter with floats installed. Refer to Figure 10-2-3. Each envelope corresponds to one of three V_{NE}/altitude envelopes as described in Paragraph 10-2-4 of this supplement. Refer also Figure 10-2-1.

2. Envelope A is the lightest weight envelope with limits as follows:

   a. Upper weight limit is 2350 lb.

   b. Forward limit at 92.0 inches.

   c. Aft limit varies linearly from 94.6 inches at 2350 lb to 98.5 inches at and below 2070 lb.

3. Envelope B is the next heavier envelope with limits as follows:

   a. Upper weight limit is 2450 lb.

   b. Forward limit varies linearly from 93.8 inches at 2450 lb to 92.0 inches at 2350 lb.

   c. Aft limit varies from 96.0 inches at 2450 lb to 98.3 inches at 2280 lb and 98.5 inches at 2070 lb.

d. Lower limit corresponds to the upper and aft limit of Envelope A.

4. Envelope D is the heaviest envelope with limits as follows: (For float operations, Envelope C has been combined with Envelope D.)

   a. Upper weight limit is 2600 lb.

   b. Forward limit varies linearly from 96.3 inches at 2600 lb to 93.8 inches at 2450 lb.

   c. Aft limit varies linearly from 98.0 inches at 2600 lb to 98.3 inches at 2280 lb.

   d. Lower limit corresponds to the upper and aft limits of Envelope B.

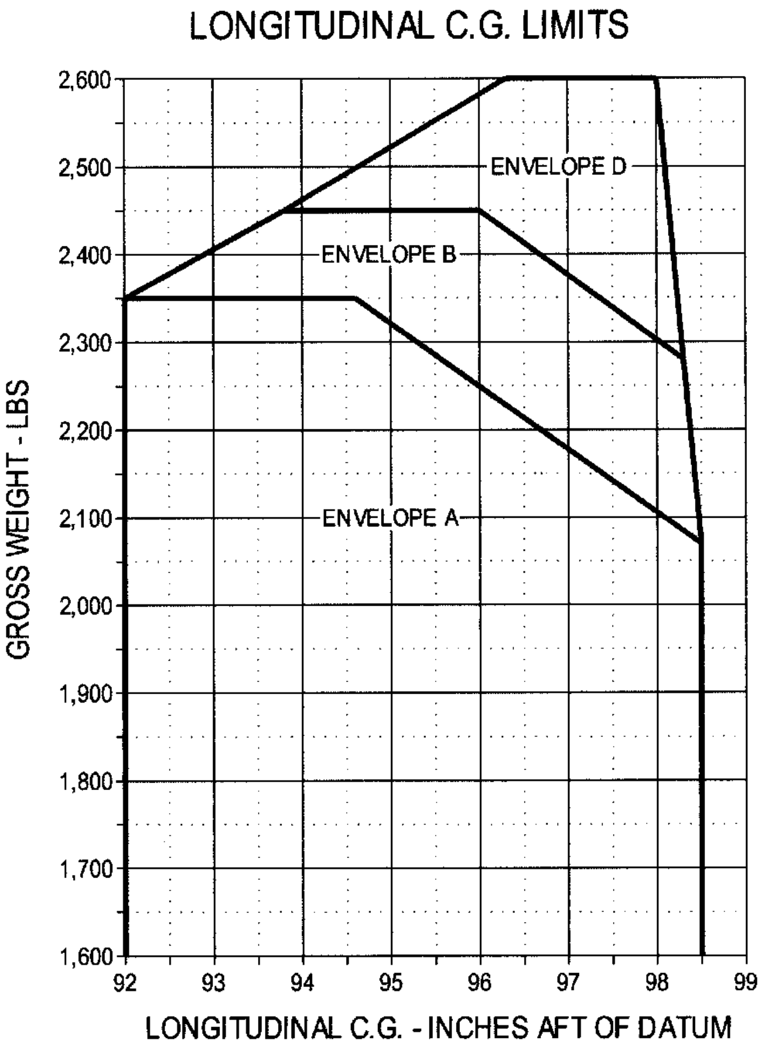

Figure 10-2-3. Longitudinal C.G. Limits

SECTION 10

SUPPLEMENT 3

EXTERNAL LOADS

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SUPPLEMENT 3

EXTERNAL LOADS

SECTION I. GENERAL

10-3-1. Introduction

This supplement must be attached to the Approved Rotorcraft Flight Manual when the Enstrom Cargo Hook Kit No. 28-22000 is installed and utilized for transportation of external cargo. Operation in compliance with Section 2, "Operating Limitations", of the Approved Rotorcraft Flight Manual is mandatory except as modified by this supplement. Other approved sections and supplemental data are recommended procedures.

10-3-2. Description

This aircraft is certified for multiple certificate operation at gross weights up to 2600 lb for restricted category cargo hook operations. A log book entry shall be made when changing category of operation.

This Cargo Hook Kit incorporates electro-mechanical cargo release features.

SECTION II. OPERATING LIMITATIONS

10-3-3. Engine Limits

3050 RPM, 39.0 inches manifold pressure (225 hp)

10-3-4. Airspeed Limitations

When operating with an external load, use Envelope D airspeed limits. Refer to Basic Rotorcraft Flight Manual for airspeed limits when operating without external load.

CAUTION

The maximum safe airspeed for satisfactory handling characteristics is dependent upon many variables, i.e., aerodynamic shape, load, c.g. of load, length of sling, location of suspension points and rate of climb or descent. Caution should be exercised as the onset of unsatisfactory handling characteristics may be abrupt.

10-3-5. Altitude Limitations

Same as Basic Rotorcraft Flight Manual.

10-3-6. Weight Limitations

1. The total weight of the helicopter and load combination shall not exceed 2600 lb. Reference Title 14 CFR, Part 133, Subpart D.

2. Maximum external load: 1000 lb

10-3-7. Center of Gravity Limitations

Same as Basic Rotorcraft Flight Manual.

1. Lateral offset moment: For weights 2350 lb and under, refer to Basic Rotorcraft Flight Manual.

2. Lateral offset moment: For operations above 2350 lb, -1620 in-lb to -3250 in-lb.

10-3-8. Type of Operations

1. Approved for multiple certificate operations under provisions of Title 14 CFR, Part 133 for Class B Rotorcraft-Load combinations.

2. Normal operations under Title 14 CFR, Part 91 can be conducted with the cargo hook installed, providing external cargo is not being transported.

10-3-9. Placards

1. Placards in view of pilot:

APPROVED FOR CLASS B ROTORCRAFT-LOAD OPERATION. OCCUPANCY LIMITED TO SOLO PILOT WHEN CARRYING EXTERNAL LOAD. USE ENVELOPE D NEVER EXCEED SPEEDS.

2. Installed on cargo hook:

EXTERNAL LOAD LIMIT 1,000 LB

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SECTION 3. EMERGENCY AND MALFUNCTION PROCEDURES

10-3-10. Electrical Failure

To drop cargo in the event of an electrical failure, pull the mechanical manual release handle located on the pilot's cyclic stick just forward of the cyclic grip.

NOTE

The cargo mechanical release will function regardless of position of cargo hook arming switch.

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SECTION IV. NORMAL PROCEDURES

10-3-11. Preflight Operation Check

1. Check electrical release system.
   a. Turn master switch on.
   b. Place instrument panel cargo hook arming switch (labeled ARMING SW CARGO HOOK) to the ON position.
   c. Place a load (3 lb minimum) on cargo hook beam.
   d. Press the CAR SLING RLSE switch on pilot's cyclic grip and the beam will release. If the momentary release switch is held in the ON position, the cargo hook beam will not re-latch. After the switch is released, check to see if beam automatically re-latches.
2. Check mechanical release system (emergency release).
   a. All switches OFF.
   b. Place load (3 lb minimum) on cargo hook beam.
   c. Activate emergency release by pulling the "T" handle mounted on the pilot's cyclic stick. Approximately 1.5 inches of travel is required to release the cargo hook beam.
   d. After load releases, push "T" handle in and check hook beam for automatic re-latching.

10-3-12. Static Electricity Discharge

Provide ground crew with instructions as follows: Discharge helicopter static electricity before attaching cargo by touching the airframe with a ground wire, or if a metal sling is used, the hook-up ring can be struck against the cargo hook. If contact has been lost after initial grounding, the helicopter should be electrically re-grounded and, if possible, contact maintained until hook-up is completed.

10-3-13. Cargo Hook Operation

1. The cargo hook arming switch can be turned OFF in steady cruise flight to prevent unintentional operation. Turn the cargo hook arming switch ON during hook-up, take-off and climb-out, and approach for release.

2. To release the cargo, press the CAR SLING RLSE switch on the cyclic grip.

NOTE

The cargo hook release button on the cyclic grip will not operate if the cargo hook arming switch is OFF.

SECTION V. PERFORMANCE

Same as Basic Rotorcraft Flight Manual data.

SECTION VI. WEIGHT AND BALANCE

A new weight and balance should be calculated per the instructions in Section 6 of the Basic Rotorcraft Flight Manual using the following information:

Table 10-3-1. Weight and Balance Information

ITEM	WEIGHT (lb)	ARM (in)	MOMENT (in-lb)
Cargo Hook Installation	15	95.50	1432.5
Hook Load		95.94	

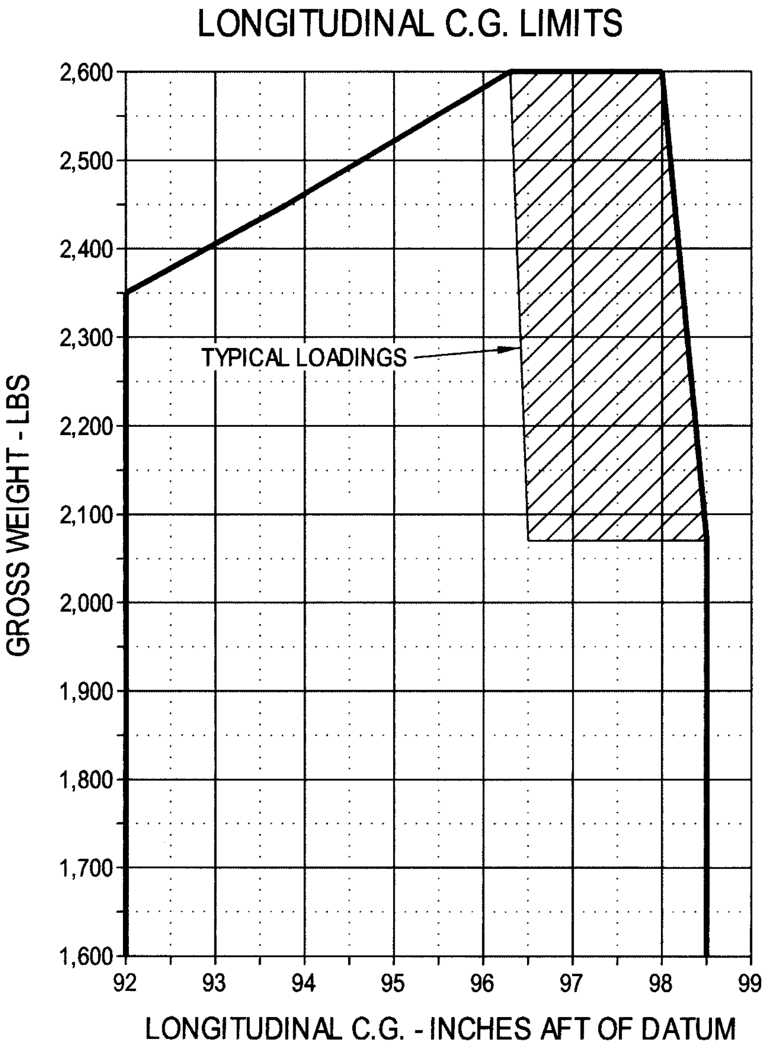

Figure 10-3-1. Longitudinal C.G. Limits

SECTION 10

SUPPLEMENT 4

SNOWSHOE

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SUPPLEMENT 4

SNOWSHOE

SECTION I. GENERAL

10-4-1. Introduction

This supplement must be attached to the Basic Rotorcraft Flight Manual when the Enstrom Snowshoe Kit No. 28-22400 is installed. Operation in compliance with Section 2, "Operating Limitations", of the Basic Rotorcraft Flight Manual is mandatory except as modified by this supplement. Other approved sections and supplemental data are recommended procedures.

10-4-2. Description

The snowshoe kit consists of four snowshoe pads, two on each skid tube, and will permit landings in various snow conditions.

SECTION II. OPERATING LIMITATIONS

Same as the 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

Same as Basic Rotorcraft Flight Manual.

SECTION VI. WEIGHT AND BALANCE

A new weight and balance should be calculated per the instructions in Section 6 of the Basic Rotorcraft Flight Manual using the following information:

Table 10-4-1. Weight and Balance Information

ITEM	WEIGHT (lb)	ARM (in)	MOMENT (in-lb)
Snowshoe Kit	18.0	100.9	1816.2

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SECTION 10

SUPPLEMENT 11

AUXILIARY FUEL TANK

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SUPPLEMENT 11

AUXILIARY FUEL TANK

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SUPPLEMENT 11

AUXILIARY FUEL TANK

SECTION I. GENERAL

10-11-1. Introduction

This supplement must be attached to the Basic Rotorcraft Flight Manual when the aircraft is equipped with an Enstrom Auxiliary Fuel Tank Kit No. 28-01009. Operation must be in compliance with the Basic Rotorcraft Flight Manual except as modified by this supplement. Other approved sections and supplements to this Flight Manual are recommended procedures.

10-11-2. Description

The auxiliary fuel tank is a 13-gallon tank with 12.7 gallons of usable fuel and 0.3 gallons of unusable fuel. It consists of a foam-filled, neoprene bladder inside an aluminum case. It is installed in the baggage box with a line running to the main fuel tanks. The auxiliary fuel tank is equipped with a 12-volt or 28-volt electric pump which is used to transfer the fuel from the auxiliary tank to the main tanks. The auxiliary fuel tank is designed to be quickly installed and removed.

Fuel transfer is controlled by a switch on the instrument panel. Turning the switch on transfers the fuel from the auxiliary tank to the main tanks. An indicator light near the fuel transfer switch will illuminate when all of the fuel in the auxiliary fuel tank has been transferred to the main tanks. The fuel must be in the main tanks to supply the engine. This system is not designed to run the engine directly from the auxiliary fuel tank. The fuel transfer rate is approximately 25 gallons per hour, and takes approximately one-half hour to complete.

Because certain passenger load/fuel load combinations may move the center of gravity outside of the approved envelope, provisions have been included for storage of the ground handling wheels in a forward internal location. In addition to allowing a greater variety of loading, the internal storage of the ground handling wheels should increase the cruise speed by approximately 2%. The wheels have been designed to mount immediately ahead of the instrument console and the wheel bar can be stowed in the baggage box. Stowage of the ground handling wheels internally is optional; however, the pilot must ensure that operation within the approved gross weight/c.g. envelope is maintained with other baggage or ballast as required.

SECTION II. OPERATING LIMITATIONS

10-11-3. Type of Operations

Same as Basic Rotorcraft Flight Manual.

10-11-4. Airspeed Limitations

Same as Basic Rotorcraft Flight Manual.

10-11-5. Altitude Limitations

Same as Basic Rotorcraft Flight Manual.

10-11-6. Weight and Balance

Same as Basic Rotorcraft Flight Manual.

10-11-7. Placards

The following placards must be attached as described when the auxiliary fuel tank is installed in the aircraft:

1. On the auxiliary fuel tank near the filler cap: (Placard P/N's 28-12433-1 and 28-22565-11)

FUEL 100/130 OCT

And

13 GAL

2. On the instrument panel below the transfer switch: (Placard P/N 28-22560-11)

TRANSFER FUEL BELOW 180 LBS

3. On the instrument panel below the transfer complete indicator light: (Placard P/N 28-22559-13)

AUX FUEL EMPTY

SECTION 3. EMERGENCY AND MALFUNCTION PROCEDURES

10-11-8. Engine Failure

1. Follow the procedures in Section 3 of the Basic Rotorcraft Flight Manual.

2. If time permits and a forced landing is imminent: Auxiliary Fuel Transfer Switch – OFF.

10-11-9. Ditching With Power

1. Auxiliary Fuel Transfer Switch – OFF.

2. Follow the procedures in Section 3 of the Basic Rotorcraft Flight Manual.

10-11-10. Fire in Flight

1. Auxiliary Fuel Transfer Switch – OFF.

2. Follow the procedures in Section 3 of the Basic Rotorcraft Flight Manual.

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SECTION IV. NORMAL PROCEDURES

10-11-11. Fueling

1. Use only 100/130 or 100LL avgas.
2. After securing the filler cap, make sure the area around the filler is dry. If any fuel has spilled, it must be cleaned up.
3. Ventilate the baggage box thoroughly after refueling.

10-11-12. Preflight Inspection

The following items are added to the preflight inspection as described in Section 4 of the Basic Rotorcraft Flight Manual.

1. Baggage Box
    a. Check security of fuel tank and transfer pump.
    b. Check fuel quantity and fuel tank cap security.
    c. Check fuel lines for leaks.
    d. Drain fuel sample into jar and check fuel grade, and check for impurities.

10-11-13. Before Starting Engine

1. Transfer pump – OFF.
2. Complete Prestart Check List as described in Section 4 of the Basic Rotorcraft Flight Manual.

10-11-14. Fuel Transfer

1. When the fuel quantity in the main tanks reaches approximately 180 lb, turn Fuel Transfer Switch ON.
2. When the "Aux Fuel Empty" indicator illuminates, turn Fuel Transfer Switch OFF.

NOTE

If there is insufficient room in the main tanks to hold the fuel transferred from the auxiliary tank, the excess fuel will be dumped overboard through the fuel tank vents.

10-11-15. Trim

Because use of the auxiliary fuel tank will tend to move the center of gravity toward the aft limit, it may be desirable to increase the forward cyclic trim authority. This may be accomplished by readjusting the longitudinal bias spring under the right hand seat. Refer to Maintenance Manual, Cyclic Trim Rigging Procedure, MM-22-7.

10-11-16. Internal Ground Handling Wheel Storage

1. After the wheels have been raised and the helicopter is on its skids, remove the latch pins on the inboard end of the axle by pulling upward.

2. Remove the washer on the inboard end of the axle and remove the wheel from the skid by pulling outward.

3. Replace the washer and latch pin on the axle.

4. Remove a handle from the wheel bracket on the instrument console and slide this handle through the center of the wheel, from the outside of the wheel inward.

5. Slide the handle into the bracket and turn the handle until it slides into the detent in the tube. Then, while still pushing, turn the handle approximately one-quarter turn clockwise to lock.

6. Check to assure that the handle is locked in place. The spring on the side of the bracket should also be slightly compressed.

7. Repeat steps 1-6 with the remaining wheel.

8. To remove the handles from the bracket, push inward and turn the handle counterclockwise until it stops, approximately one-quarter turn, then pull straight out on the handle.

SECTION V. PERFORMANCE

There is no change to the performance section of the Basic Rotorcraft Flight Manual. Internal stowage of the ground handling wheels should yield approximately a 2% increase in cruise speed for a given power setting. All limitations listed in the Basic Rotorcraft Flight Manual remain in effect for this configuration.

SECTION VI. WEIGHT AND BALANCE

When an Enstrom auxiliary fuel tank kit No. 28-01009 is installed, a new weight and balance should be computed as described in Section 6 of the Basic Rotorcraft Flight Manual, incorporating the following information:

Table 10-11-1. Weight and Balance Information

ITEM	WEIGHT (lb)	ARM (in)	MOMENT (in-lb)
Fixed lines and provisions	2.3	79.1	182.0
Auxiliary fuel tank	20.3	135.0	2740.5
Unusable fuel in auxiliary tank	2.0	135.0	270.0
	24.6		3192.4

10-11-17. Center of Gravity Limits

Refer to Basic Rotorcraft Flight Manual.

Note that the typical data points shown use 170 lb as the minimum weight pilot. Certain solo lightweight pilot configurations may require additional ballast in the cockpit to remain within the approved c.g. envelope.

Typical load condition:

Table 10-11-2. Center of Gravity Limits

ITEM	WEIGHT (lb)	C.G. (in)	MOMENT (in-lb)
Basic aircraft	1620	100.5	162,810
Auxiliary fuel tank with usable fuel	25		3,192
	1645	100.91	166,022
Pilot and passenger	388	62.0	24,056
Full fuel	240	96.0	23,040
Auxiliary fuel	74	135.0	9,990
	2347	95.05	223,088
Relocate ground handling wheels	- 12	104.7	- 1,256
	+ 12	16.6	+ 199
			- 1,057
Stow wheel bar	3	135	+ 405
Wheels relocated	2350	94.65	222,436

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SECTION 10

SUPPLEMENT 12

ENGINE EXHAUST MUFFLER

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SUPPLEMENT 12

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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