

ENSTROM 280F
OPERATORS MANUAL
AND
F.A.A. APPROVED
ROTORCRAFT FLIGHT MANUAL

REPORT NO. 28-AC-019

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 F.A.A. APPROVED.
SECTION 10 INCLUDES SUPPLEMENTS TO THE TYPE
CERTIFICATE WHICH ARE F.A.A. APPROVED IF SO DESIGNATED.

F.A.A. APPROVED BY:

_____

FOR MANAGER
CHICAGO AIRCRAFT CERTIFICATION OFFICE
CENTRAL REGION
FEDERAL AVIATION ADMINISTRATION

DATE: DEC. 31, 1980

REVISED: November 7, 1989



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TWIN COUNTY AIRPORT • P.O. BOX 277, MENOMINEE, MICHIGAN 49858

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SECTION 3

EMERGENCY AND MALFUNCTION PROCEDURES

REVISIONS:

FAA Approved: 12/31/80
Revised: 1/30/84



SECTION 3 - EMERGENCY AND MALFUNCTION PROCEDURES

I. GENERAL

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

II. 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. When 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 sufficient rotor rpm for a successful landing.

A. Engine Failure - Altitude above 375 ft AGL.

When engine failure occurs proceed as follows:

1. Enter autorotation (collective full down, throttle to idle and right pedal to trim helicopter).
2. Stabilize at 58 mph glide (best rate of descent speed).

CAUTION: Due to high rates of descent, sustained autorotation speed is limited to 85 mph to 8200 ft; above 8200 ft see Figure 5.1. Maximum glide distance in autorotation is attained at 80 mph and 334 rotor rpm. Reduce collective to build rpm prior to touchdown.

3. Check engine and rotor rpm. Adjust collective to keep rotor in green arc. If engine is stopped, turn OFF fuel boost pump and place mixture control in ICO position. If altitude and time permit, see Air Restart Procedure, Section 3.2
4. 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.

5. At approximately 50 ft AGL apply aft cyclic to reduce speed.



6. Level helicopter with forward cyclic at an altitude sufficient to provide tail rotor clearance. As helicopter settles toward ground, apply up collective to cushion landing.
7. 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.

B. Air Restart

After an engine failure 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.

DO NOT attempt air restart when below 3000 ft AGL.

1. Adjust collective as required to maintain rotor rpm in green arc and establish 58 mph autorotative glide.
2. Select landing site.
3. Grip cyclic between knees and with right hand turn fuel boost pump OFF and pull mixture control to ICO.
4. Rotate throttle to start position (start index up).
5. Engage starter.
6. When engine fires, mixture full rich and boost pump ON.
7. Slowly increase throttle until engine and rotor tach needles join in green arc.

C. Engine Failure - Altitude above 10 feet and below 375 ft AGL.

When 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. When engine failure occurs proceed as follows:

1. Adjust collective to maintain rotor rpm, throttle to idle position and right pedal to trim helicopter.

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2. Adjust cyclic for autorotative glide.

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.

3. At altitude of approximately 50 ft AGL use aft cyclic to reduce forward speed.
4. Level helicopter with forward cyclic at an altitude sufficient to provide tail rotor clearance.
5. As helicopter settles toward the ground apply up collective to cushion landing.
6. 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.

D. Engine - Failure at Hover

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:

1. Apply right pedal to prevent yawing and align skids in direction of motion.
2. DO NOT reduce collective.
3. As helicopter settles to the ground, add up collective to cushion landing.

III. DITCHING WITHOUT POWER

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

- A. Unlatch doors.
- B. Land. Complete normal autorotational landing in water.
- C. As collective reaches full up position and helicopter settles in water, apply full lateral cyclic in direction helicopter tends to roll.

REVISIONS:

FAA Approved: 12/31/80
Revised: 12/14/88



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

WARNING: Clear helicopter as quickly as possible.

IV. DITCHING WITH POWER

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

- A. Descend to low hovering altitude over water.
- B. Unlatch both doors.
- C. Exit passengers.
- D. Hover clear of passengers.
- E. Turn off master and alternator.
- F. Close throttle and complete hovering autorotation.
- G. As collective reaches full up position and helicopter settles into water, apply full right lateral cyclic.
- H. Exit helicopter when rotor stops.

WARNING: Clear helicopter as quickly as possible.

V. 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 turbocharger seizes or the wastegate seizes in the full bypass condition, proceed as follows:

- A. Perform a power check to confirm power available for landing.
- B. Land as soon as practicable, using running landing (see Section 4, paragraph XVI).

VI. LOW ENGINE OIL PRESSURE

A. 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:



1. Land at nearest suitable landing area.
2. Inspect for and correct this source of trouble before continuing flight.

8. 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 the engine failure is imminent. Proceed as follows:

1. Reduce engine power immediately.
2. Select a suitable forced landing field and land with power.

VII. 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 the appropriate emergency procedures to follow:

A. 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.

1. 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:

- a. Roll throttle off to full idle position. Helicopter will slow down or stop rotation.
- b. As helicopter settles to ground, cushion landing with up collective (throttle off).

2. During flight near suitable landing area

Helicopter will rotate to right with full application of left pedal. Proceed as follows:

- a. Roll throttle full off to idle and enter autorotation.
- b. Complete autorotational landing.



3. During flight

If suitable landing area is not available within autorotative glide distance, pilot should proceed as follows after establishing autorotation at 60 mph or above:

- a. Increase collective pitch and power gradually, maintaining 60 to 80 mph until yaw to the right reaches a maximum of 45°.
- b. Continue flight in this fashion using cyclic stick for directional control until suitable autorotational landing site is reached.
- c. Complete autorotational landing.

B. 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.

1. 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:

- a. Remove feet from pedals.
- b. Maintain 24 inches manifold pressure and 50 mph.
- c. Fly to suitable area and complete a shallow power on approach at 50 mph.
- d. Adjust throttle and collective pitch so the helicopter touches down straight ahead at an airspeed of 0-10 mph. Reduce throttle and collective cautiously as skids contact surface.

CAUTION: DO NOT abort the emergency landing after airspeed has diminished below 40 mph.

1. 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 in. manifold pressure. Power settings above 23 in. manifold pressure will produce near normal flight conditions at airspeeds above 60 mph. Proceed as follows:



- a. Fly to suitable landing area at a power setting of at least 23 in. manifold pressure and 60 mph or above.
- b. Complete a shallow power-on approach at 60 mph.

CAUTION: DO NOT AUTOROTATE.

- c. Adjust throttle and collective pitch so that the helicopter touches down straight ahead at an airspeed of 0 to 10 mph.
- d. 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.

C. 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.

VIII. MAIN ROTOR GEARBOX

If the main rotor gearbox temperature exceeds red line or the main rotor gearbox chip detector light comes on, accomplish a power-on approach and landing immediately.

IX. FIRE IN FLIGHT

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

- A. Land immediately using power-on approach.
- B. Turn the master and alternator switch to the OFF position.
- C. If smoke obstructs vision, unlatch doors and let them trail open.
- D. Shut off engine as soon as helicopter is on the ground.
- E. Fuel valve OFF.
- F. Pilot and passengers clear the helicopter immediately.



X. FIRE ON THE GROUND

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

- A. Shut of engine and all switches.
- B. Shut fuel valve OFF.
- C. Pilot and passenger clear the helicopter immediately.

XI. ALTERNATOR MALFUNCTION

A malfunction of the alternator will be indicated by zero charge rate or constant discharge on the ammeter. To put the alternator back on the line, proceed as follows:

- A. Alternator circuit breaker in.
- B. Alternator excite circuit breaker in.
- C. Cycle alternator switch.
- D. If alternator is not restored or goes off the line again, turn off all nonessential electrical equipment and land as soon as practicable.

XII. ELECTRIC BOOST PUMP FAILURE

Failure of the electric fuel boost pump will be indicated by illumination of red, low boost warning light. The engine will continue to function. If the low boost warning light comes on, land as soon as practicable.

XIII. CLUTCH DISENGAGEMENT LIGHT ON

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

- A. Clutch Disengagement Light on with Motion Cues
 - 1. Enter autorotation and reduce power to idle.
 - 2. Perform autorotative landing.
 - 3. Inspect for and correct the source of trouble before continuing flight.



B. Clutch Disengagement Light on without motion cues

1. Reduce power and be prepared for sudden clutch disengagement.
2. Land at nearest suitable landing area.

CAUTION: Be prepared for autorotation should clutch become disengaged.

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

XIV. 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 on the spot. 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.

REVISIONS:

FAA Approved: 12/31/80
Revised: 12/14/88

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XV. 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.



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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.

8. Shutdown – Complete.



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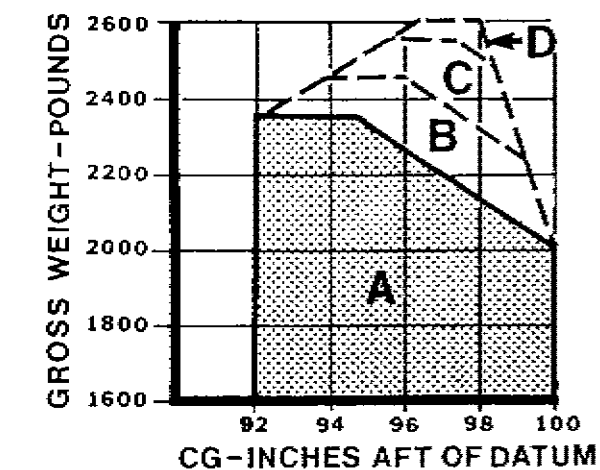
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SECTION 5
PERFORMANCE

REVISIONS

FAA Approved: 12/31/80
Revised: 1/30/84



The solid V_{NE} /altitude curve shown below applies only to operation with the c.g. within the shaded area shown at left (Envelope A). For operation with the c.g. in other areas, see the appropriate V_{NE} envelope.

EXAMPLE: Helicopter c.g. is 96.0 inches at 2000 lbs, use Envelope A V_{NE} .

Helicopter c.g. is 96.5 inches at 2300 lbs, use Envelope B V_{NE} (Figure 5.1B).

NOTE: Use Figure 6.1 to determine actual location of c.g.

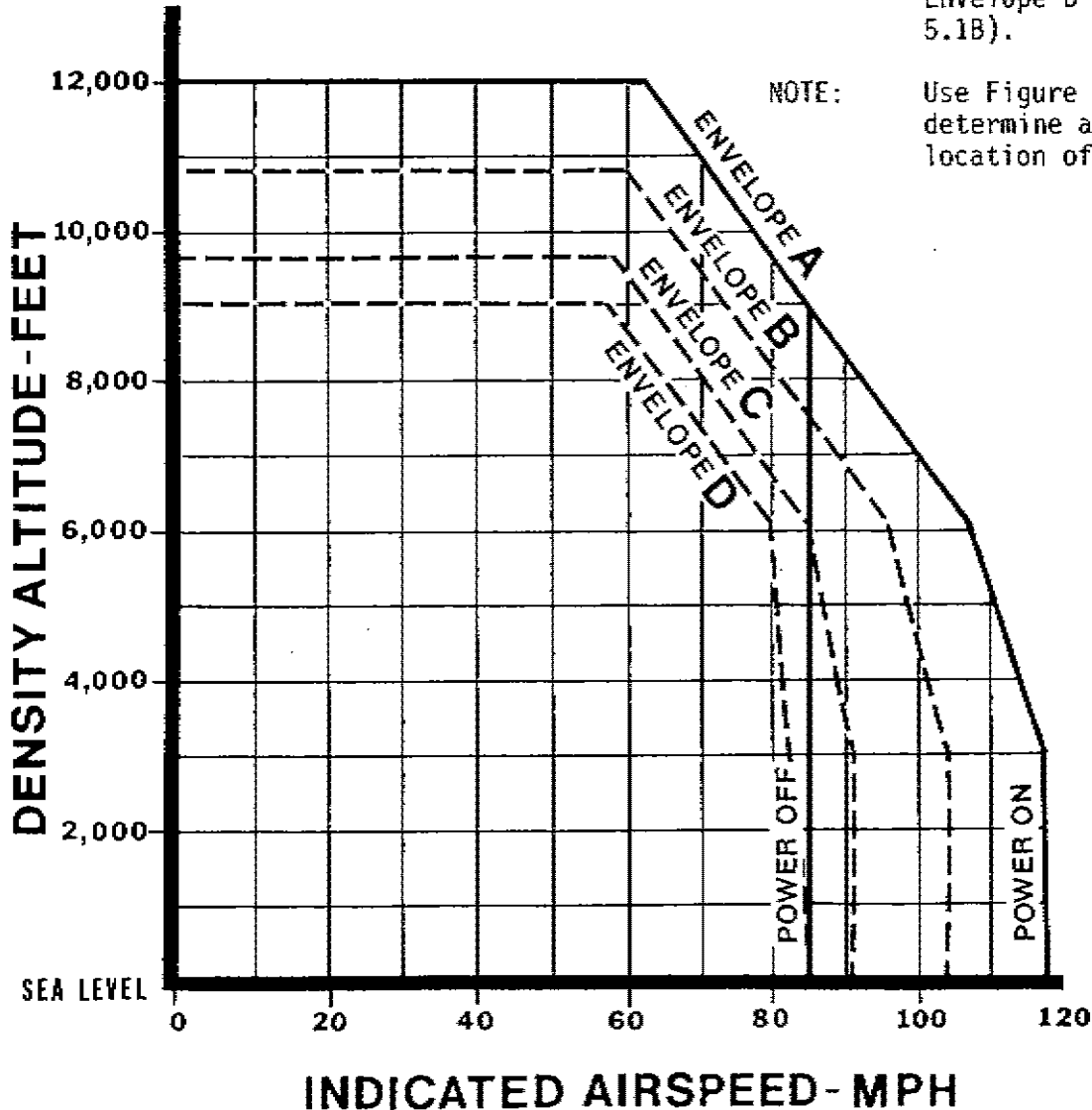
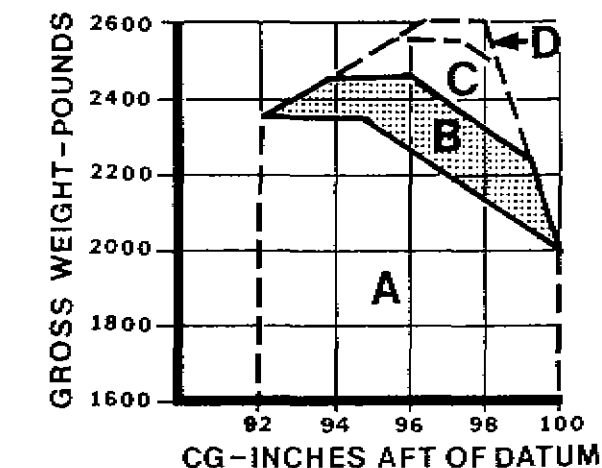


FIGURE 5.1A

V_{NE} Variation with Density Altitude for Envelope A

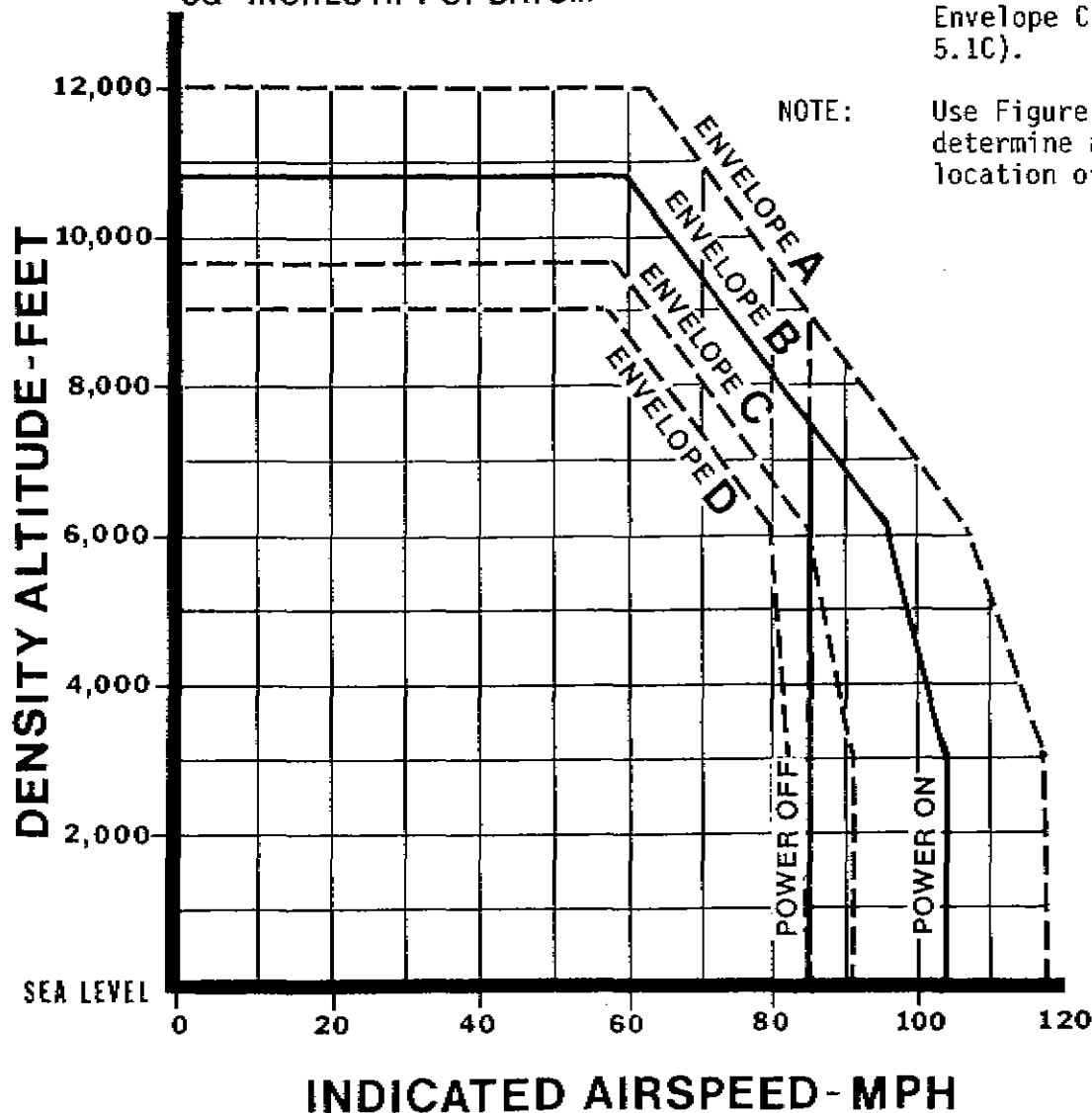
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The solid V_{NE} /altitude curve shown below applies only to operation with the c.g. within the shaded area shown at left (Envelope B). For operation with the c.g. in other areas, see the appropriate V_{NE} envelope.

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

Helicopter c.g. is 98.0 inches at 2400 lbs, use Envelope C V_{NE} (Figure 5.1C).



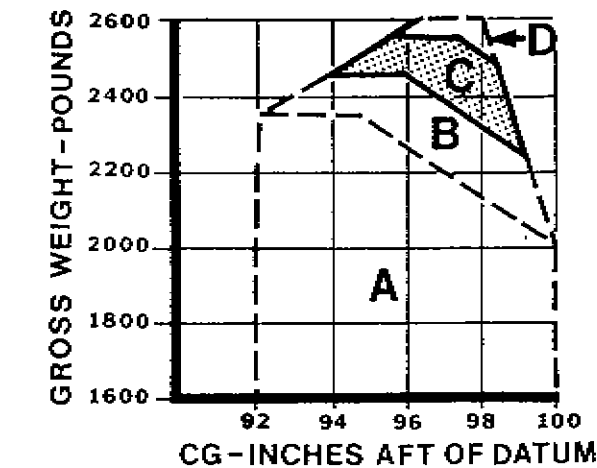
NOTE: Use Figure 6.1 to determine actual location of c.g.

FIGURE 5.1B

V_{NE} Variation with Density Altitude for Envelope B

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The solid V_{NE} /altitude curve shown below applies only to operation with the c.g. within the shaded area shown at left (Envelope C). For operation with the c.g. in other areas, see the appropriate V_{NE} envelope.

EXAMPLE: Helicopter c.g. is 98.6 inches at 2300 lbs, use Envelope C V_{NE} .

Helicopter c.g. is 93.0 inches at 2350 lbs, use Envelope A V_{NE} (Figure 5.1A).

NOTE: Use Figure 6.1 to determine actual location of c.g.

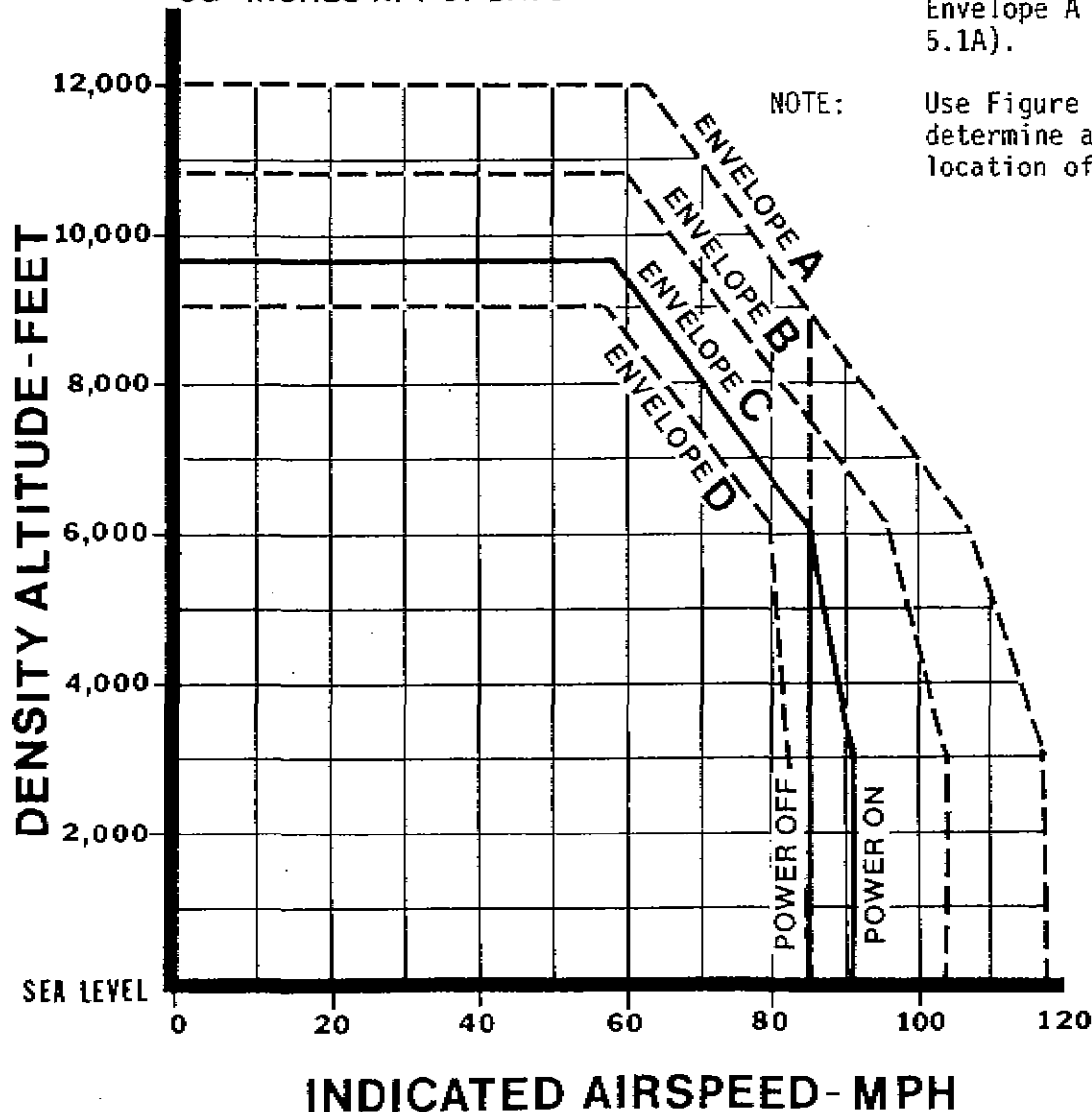
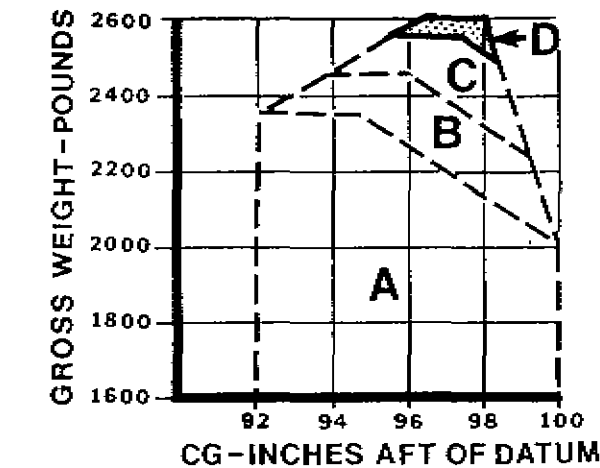


FIGURE 5.1C

V_{NE} Variation with Density Altitude for Envelope C

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The solid V_{NE} /altitude curve shown below applies only to operation with the c.g. within the shaded area shown at left (Envelope D). For operation with the c.g. in other areas, see the appropriate V_{NE} envelope.

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

Helicopter c.g. is 96.0 inches at 2550 lbs, use Envelope C V_{NE} (Figure 5.1C).

NOTE:

Use Figure 6.1 to determine actual location of c.g.

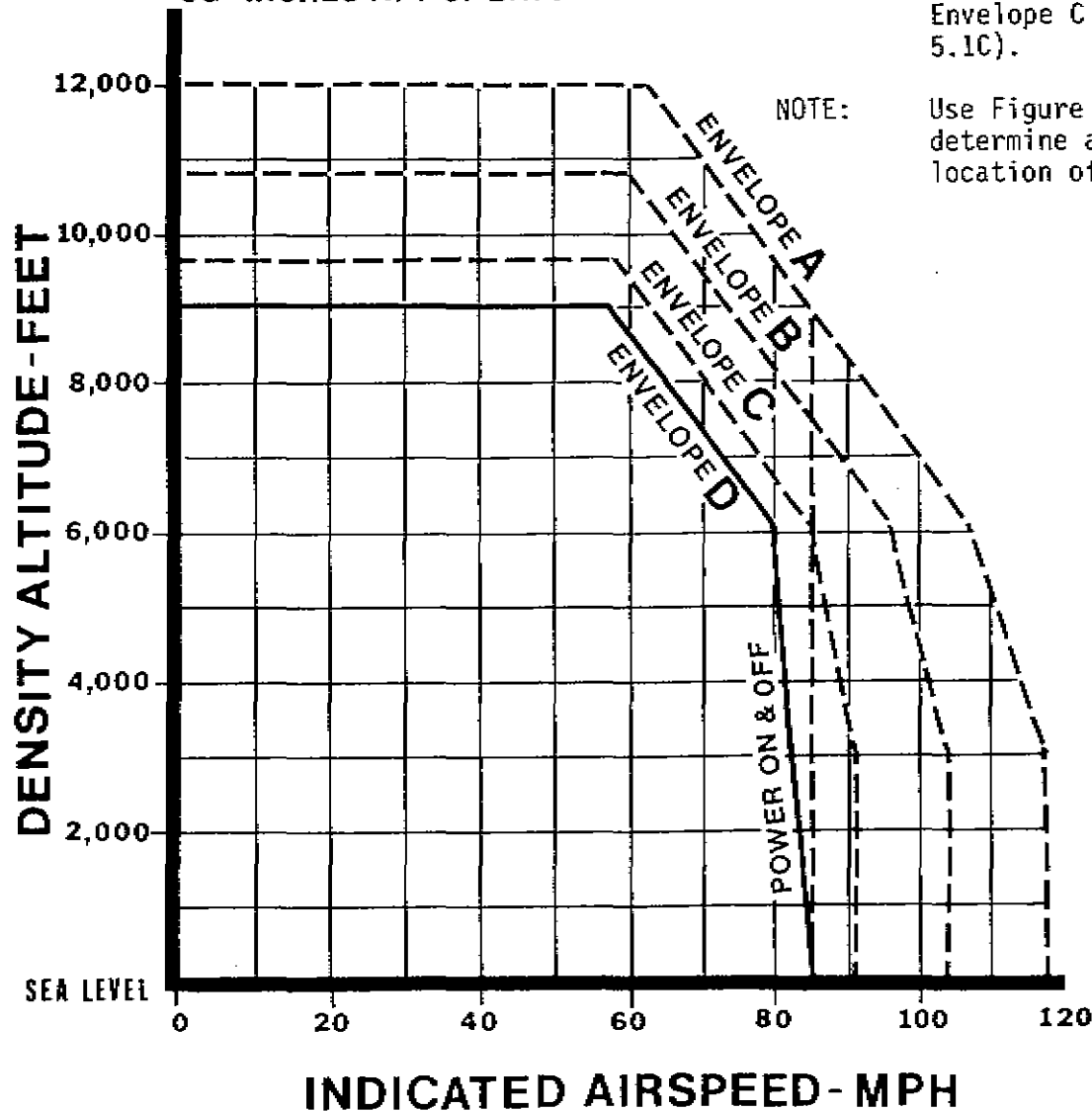


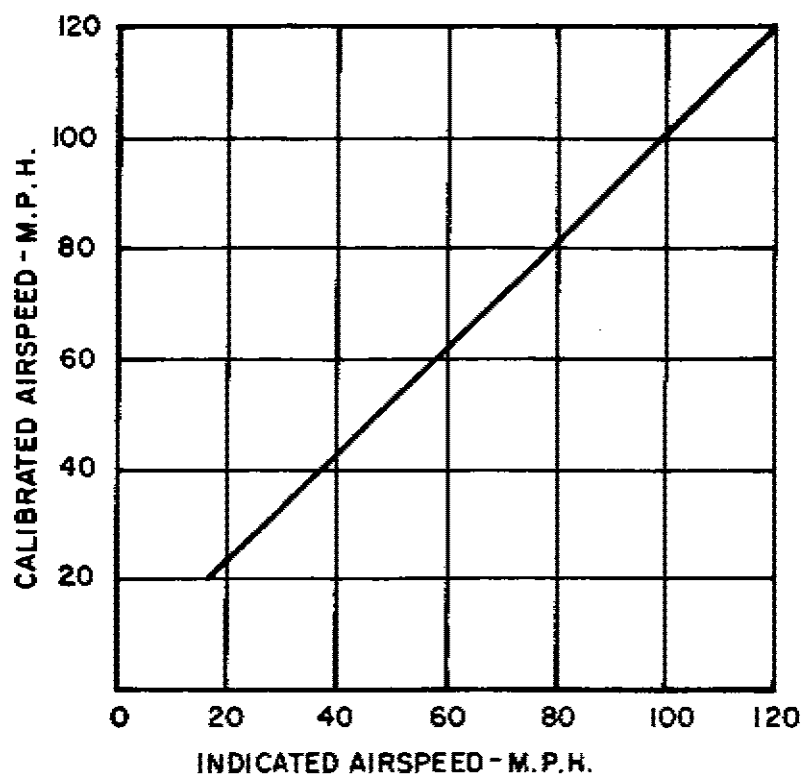
FIGURE 5.1D

V_{NE} Variation with Density Altitude for Envelope D

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ENSTROM 280F AIRSPEED CALIBRATION



NOTE: INDICATED SPEEDS BELOW 20 M.P.H. ARE NOT RELIABLE.

FIGURE 5.2

FAA Approved: 12/31/80
Revised: 7/1/84



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ENSTROM F-28F
HOVER CEILING IN-GROUND EFFECT
2 FT SKID HEIGHT
350 ROTOR RPM

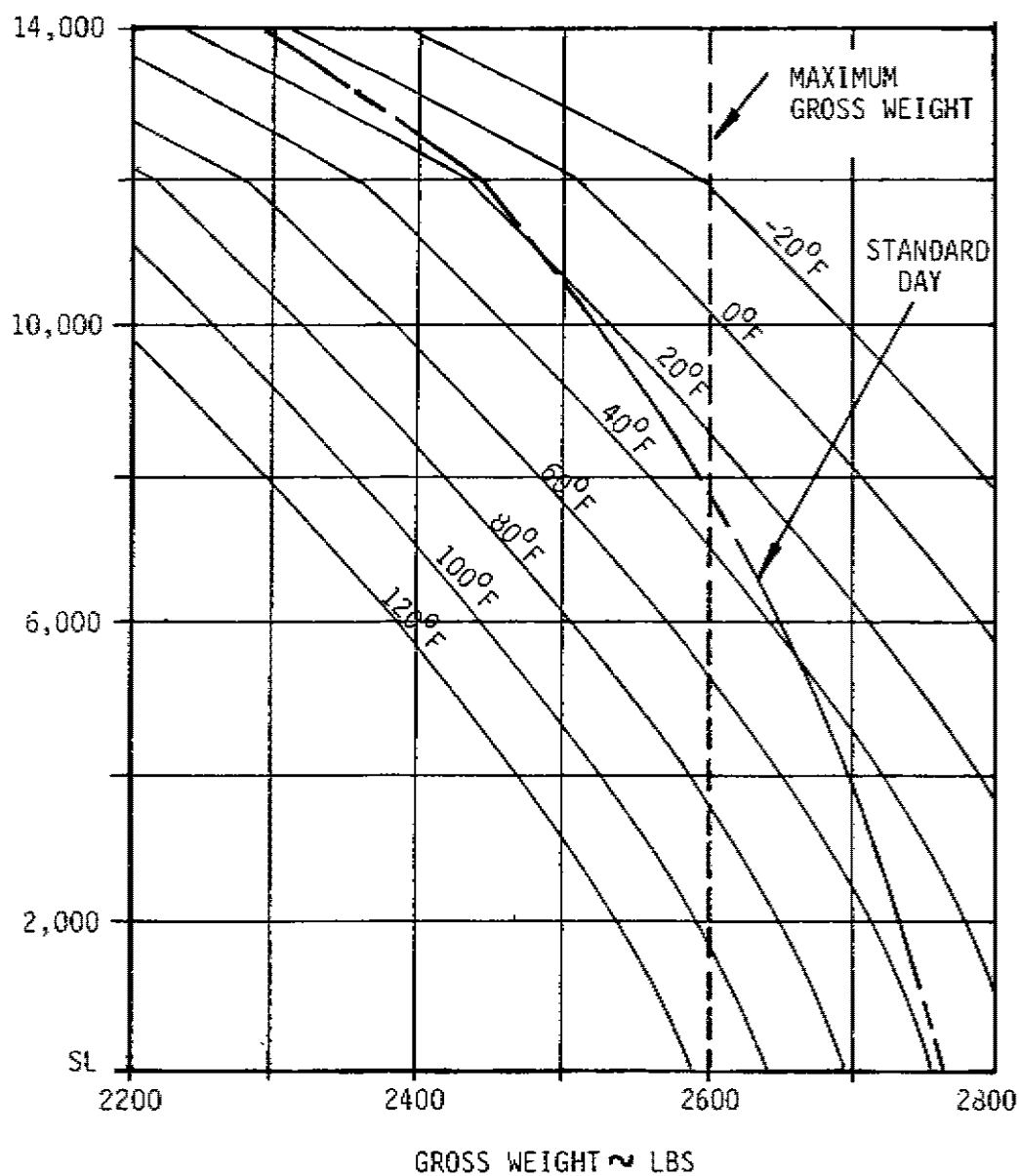


FIGURE 5.3

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ENSTROM F-28F
HOVER CEILING OUT-OF-GROUND EFFECT

40 FT SKID HEIGHT
3050 ROTOR RPM

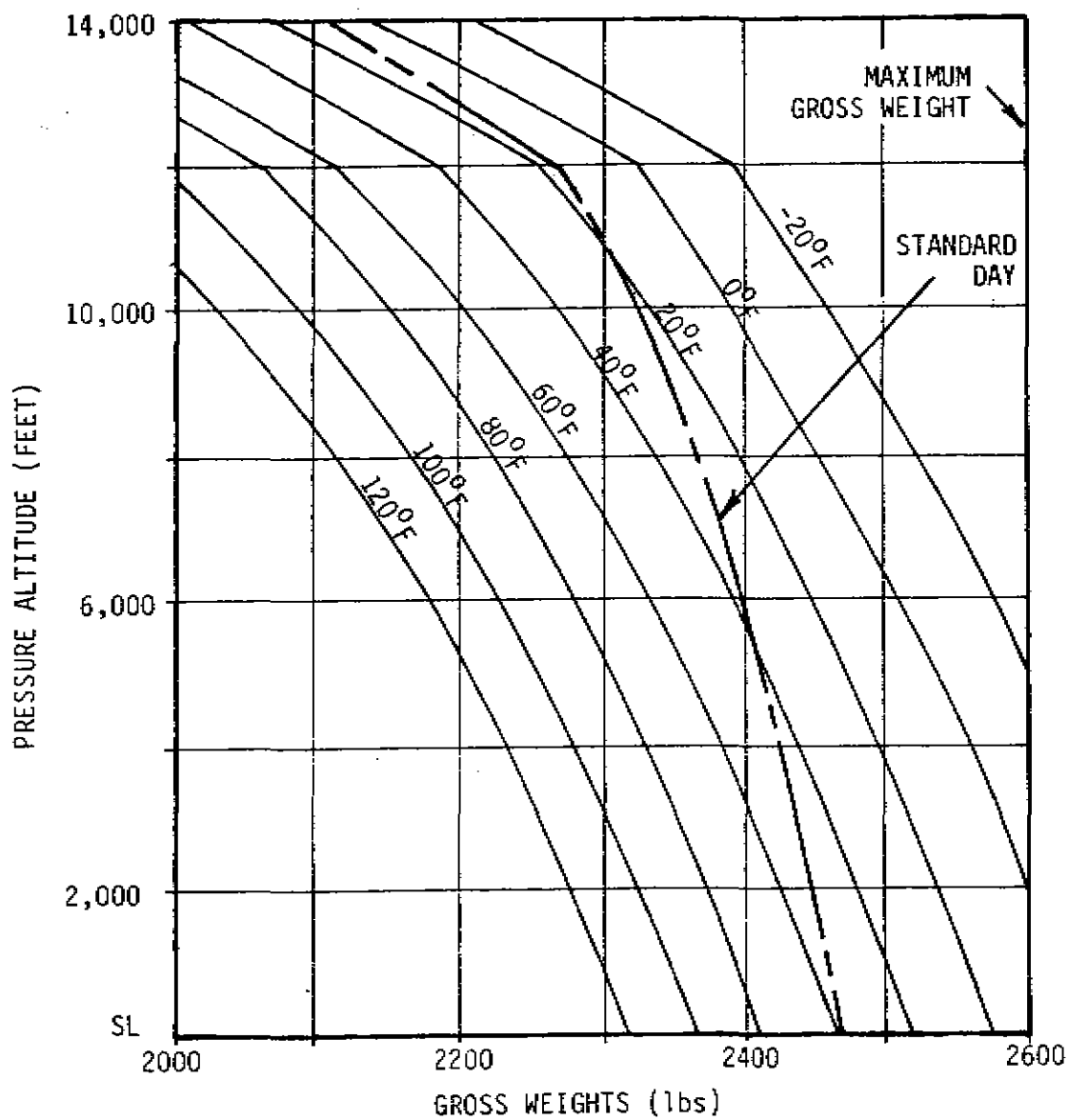


FIGURE 5.4

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HEIGHT VELOCITY DIAGRAM

2350 LBS GROSS WEIGHT

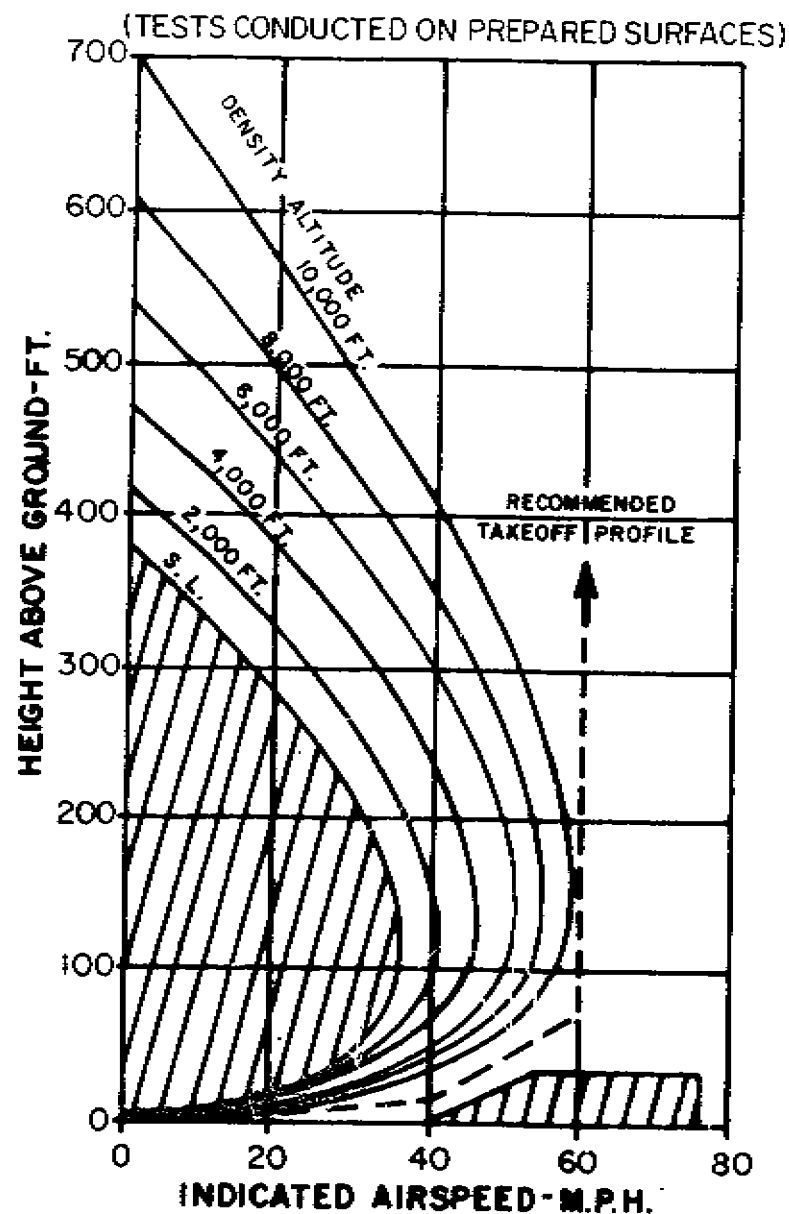


FIGURE 5.5

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Revised: 7/1/84



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 5.5.

- Example: (1) A gross weight of 2000 lbs and 3900 ft H_d would allow the use of the sea level envelope.
- (2) A gross weight of 2200 lbs and 4500 ft H_d would require a 2800 ft curve. To be conservative, use the next higher curve, 4000 ft.

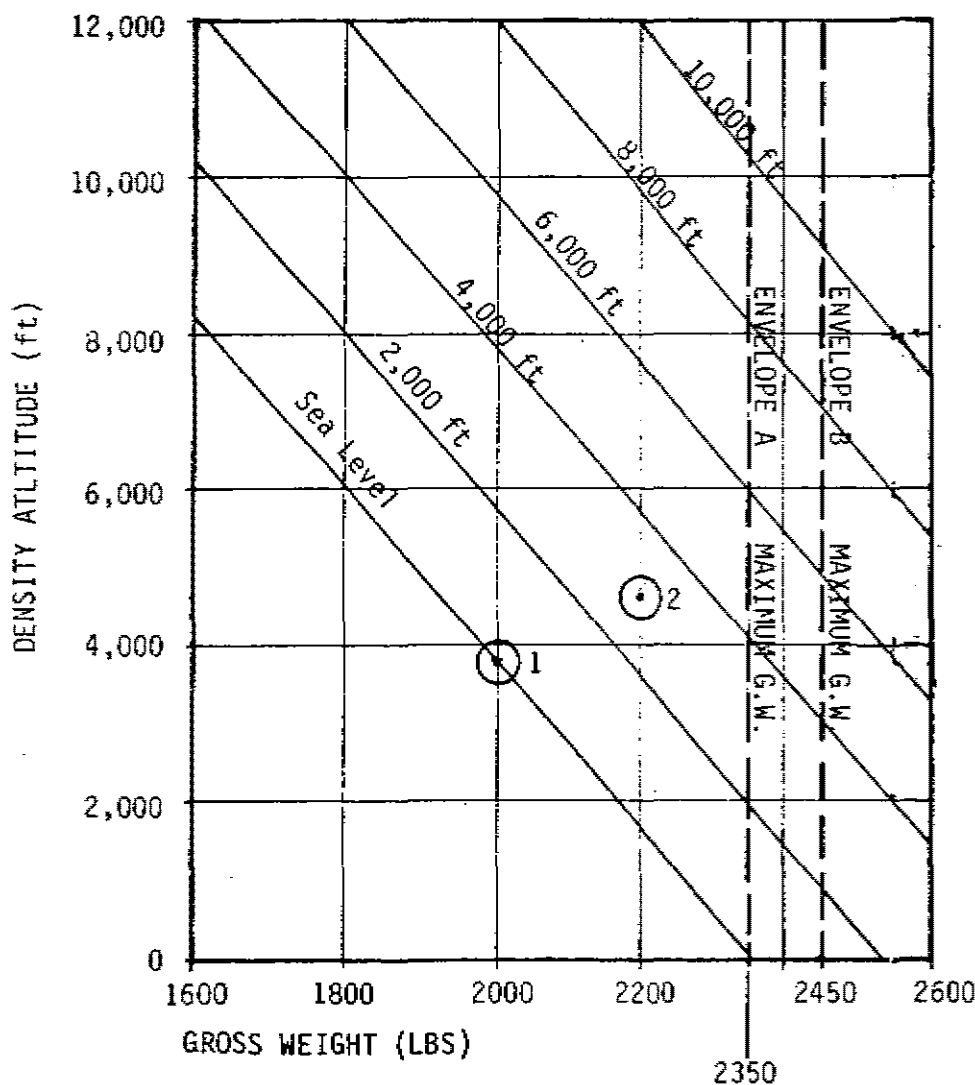


FIGURE 5.6



HEIGHT VELOCITY DIAGRAM

2600 LBS GROSS WEIGHT

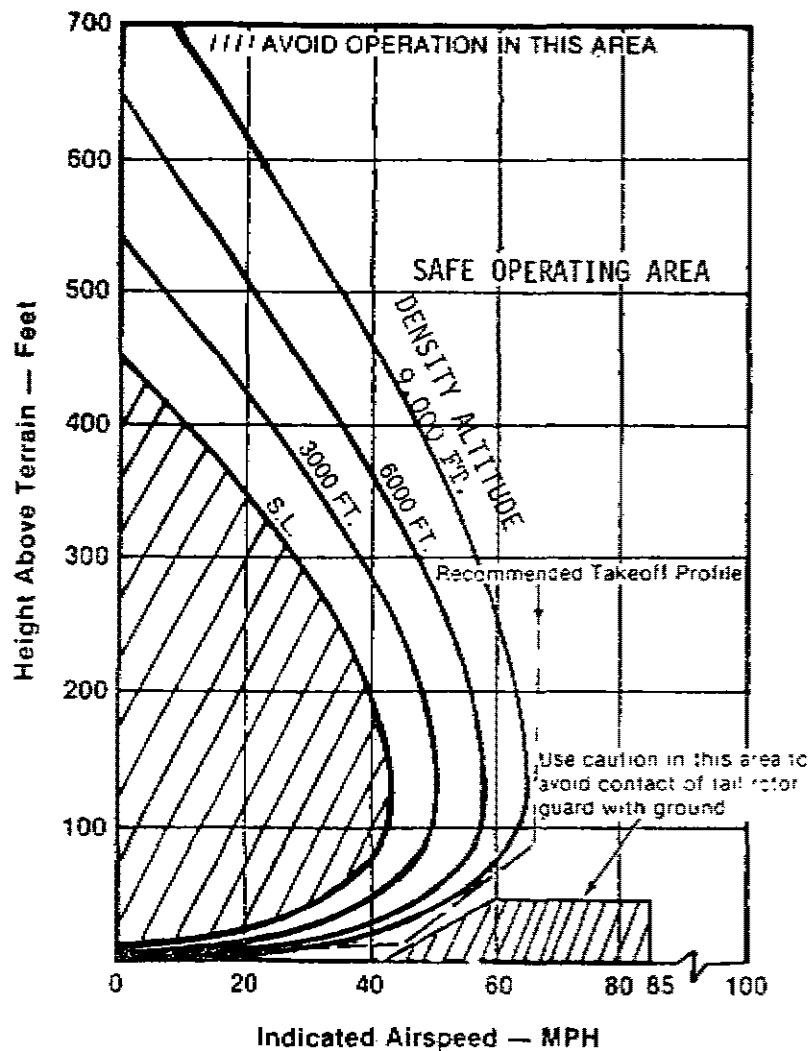


FIGURE 5.7

NOTE: Altitude operations may also be limited by V_{NE} and OGE hover. Cross check Figures 5.1 and 5.4 for intended operations when using this figure.

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DENSITY ALTITUDE CHART

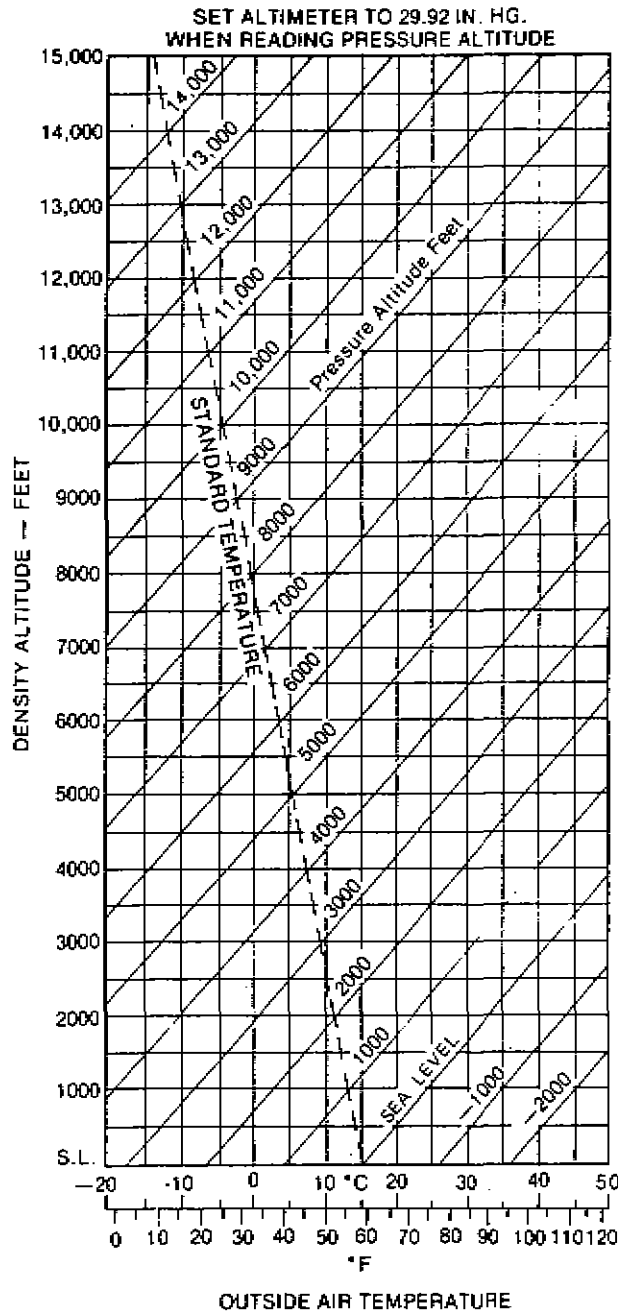


FIGURE 5.8

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RATE OF CLIMB/DENSITY ALTITUDE
2350 LBS GROSS WEIGHT

BEST RATE OF CLIMB SPEED VARIES WITH ALTITUDE
57 MPH IAS AT SL DECREASING TO 48 MPH IAS AT 12,000 FT H_d

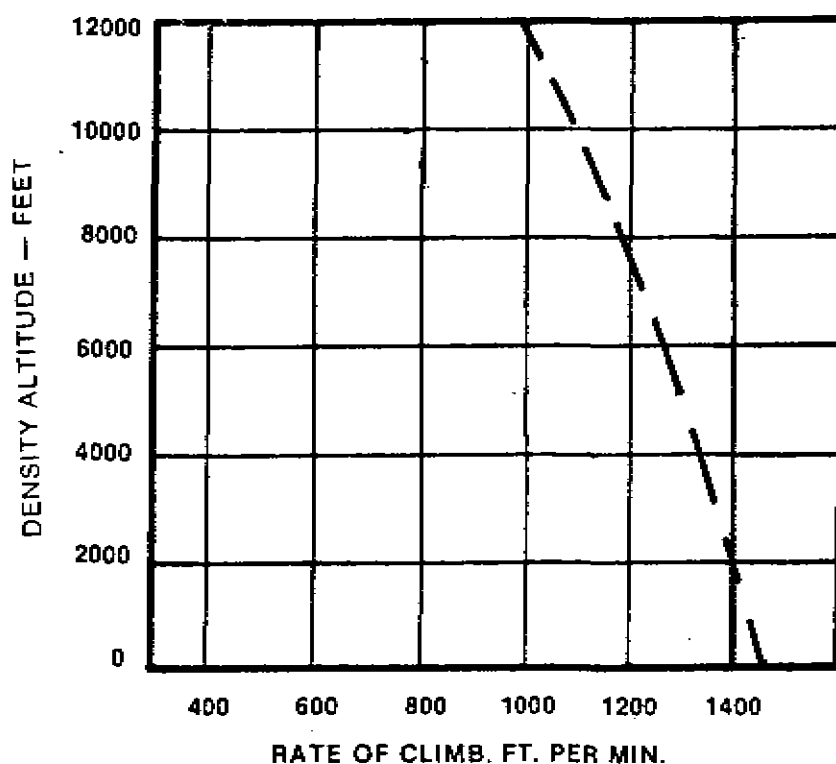


FIGURE 5.9

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Revised: 7/1/84