

**ENSTROM 480B OPERATOR'S MANUAL
AND
FAA APPROVED
ROTORCRAFT FLIGHT MANUAL
SUPPLEMENT
RA-4500 RADAR ALTIMETER**

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REPORT NO. 28-AC-071

HELICOPTER SERIAL NO. _____

HELICOPTER REGISTRATION NO. _____

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THIS SUPPLEMENT MUST BE CARRIED IN THE HELICOPTER AT ALL TIMES IF EQUIPPED WITH THE RA-4500 RADAR ALTIMETER. CHAPTERS 1, 2, 3, AND 4 ARE FAA APPROVED.

FAA APPROVED BY: *Timothy P. Smyth*
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FEDERAL AVIATION ADMINISTRATION

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PROPRIETARY

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LOG OF REVISIONS

Rev. No.	Date	FAA Approved
-	Mar 28/16	R. D. McElroy
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**Approved by the Manager,
Southwest Flight Test Section, AIR-713
Federal Aviation Administration
Ft. Worth, TX**

EASA LOG OF REVISIONS

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INTRODUCTION

Intro-1. General

This supplement contains the operating instructions, procedures, and limitations for the RA-4500 Radar Altimeter.

The supplement is divided into two basic parts, the FAA approved RFM Supplement and Supplemental Data provided by the Enstrom Helicopter Corporation (Enstrom). Chapters 1, 2, 3, and 4 make up the FAA approved RFM Supplement. It is required by Federal Regulations that this supplement be carried in the helicopter at all times if the RA-4500 Radar Altimeter is installed.

For additional information regarding the supplement format and text emphasis or definitions, refer to the Basic Flight Manual.

Intro-2. Definition of Abbreviations

Abbreviations noted in this supplement are listed in Table Intro-1.

Table Intro-1. List of Abbreviations

AGL	Above Ground Level
CCW	Counter Clockwise
CW	Clockwise
DH	Decision Height
FAA	Federal Aviation Administration
LED	Light Emitting Diode
RFM	Rotorcraft Flight Manual
RX	Receive
TX	Transmit

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CHAPTER 1. OPERATING LIMITATIONS**1-1. General**

Refer to the basic RFM.

NOTE

The radar altimeter system surveys the ground directly below the aircraft and should not be relied on as a forward-looking device.

1-2. Software Version

The system must utilize the approved software version listed in Table 1-1.

Table 1-1. Approved Software Version

Component	Approved Software Version (or later FAA approved version)
RA-4500	300A
RAD-40	0200

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CHAPTER 2. NORMAL PROCEDURES

2-1. General

Refer to the basic RFM

2-2. Starting Engine (ref. basic RFM paragraph 2-19)

1. Check that the **RAD-40** switch is set to ON.
2. After avionics master switch ON, check the RAD-40 status display sequence as follows:
 - a. During the self-test mode the altitude field displays a box as shown below.



- b. When the altimeter unit detects a locked signal, the altitude field displays the altitude.
2. Set decision height (DH) (or during flight), as required.

2-3. During Flight

1. Above 2,500 feet AGL, the radar altimeter will unlock and the RAD-40 will display four dashes. The radar altimeter may attempt to relock. If this occurs, the RAD-40 will intermittently display a random altitude, which will be obviously erroneous.
 - a. The RAD-40 display may be turned off above 2,500 feet AGL by switching the **RAD-40** switch to OFF and then back to ON when operation below 2,500 feet AGL resumes.



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CHAPTER 3. EMERGENCY PROCEDURES**3-1. General**

Refer to the basic RFM.

3-2. Abnormal Procedures

1. Four dashes in the altitude field are displayed if the altimeter cannot guarantee the validity of the altitude. If this occurs below 2,500 feet AGL:
 - a. Check for terrain, pitch or roll attitude, and descent conditions and adjust as required to re-establish a locked signal. (See paragraph 7-3.)



3. The word "Err" in the altitude field and an error code in the DH field are displayed in the event of a system error, timed-out altimeter communication, an out-of-range altitude, or a test failure.
 - a. Refer to other alternate altitude source or visual observations.



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CHAPTER 4. PERFORMANCE DATA

4-1. General

Refer to the basic RFM.

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CHAPTER 6. WEIGHT/BALANCE AND LOADING

6-1. General

Refer to the basic RFM.

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CHAPTER 7. SYSTEM DESCRIPTION AND OPERATION

7-1. Description

1. The RA-4500 radar altimeter system installation consists of the radar altimeter receiver/transmitter, the RAD-40 radar altimeter display, and two antennas. Refer to the block diagram in Figure 7-1.

- a. The RA-4500 radar altimeter is designed to provide AGL data to a RAD-40 radar altimeter display. Altitude is calculated by measuring the round trip time of a signal reflected from the ground.

NOTE

The radar altimeter altitude becomes less sensitive as the altitude AGL increases (see Table 7-1).

- b. The RAD-40 pilot controls include a **MODE** button and a rotary knob to set DH.
- c. The RAD-40 display panel (Figure 7-2) consists of a four-digit altitude field on the left, a three-digit decision height (DH) field on the right, and a DH LED near the upper right corner of the display. The DH LED illuminates when the aircraft descends below the pilot-selected DH.
- d. Some aircraft (S/N 5240 and subsequent) may be configured for an audio tone when the aircraft descends below the pilot-selected DH. The tone is interfaced through the audio panel.
- e. The transmit and receive antennas are mounted to the bottom of the tailcone just forward of the horizontal stabilizers.

4. The RA-4500 radar altimeter system is powered by the aircraft electrical system and is protected by a 3 amp circuit breaker (**RA**) located on the lower left side of the circuit breaker panel.

5. The RAD-40 radar altimeter display may be turned on or off via the **RAD-40** switch located on the lower side of the circuit breaker panel.

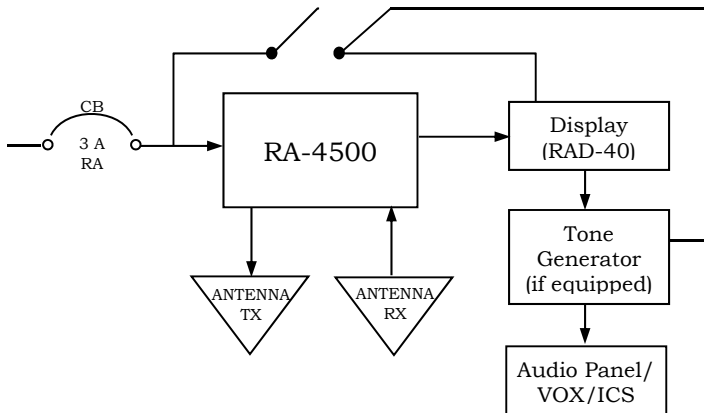


Figure 7-1. RA-4500 System Interface

Table 7-1. Altitude Display Sensitivity

Altitude AGL	Shown to Nearest
-99 to 120 feet	1 foot
120 to 200 feet	2 feet
200 to 500 feet	5 feet
500 to 1,000 feet	20 feet
1,000 to 2,100 feet	50 feet
Above 2,100 feet	100 feet

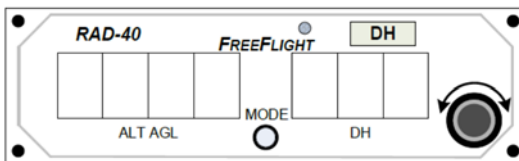


Figure 7-2. RAD-40 Display Panel

7-2. Power On

1. After power on, the RAD-40 performs a set of self-tests and a display test. The RAD-40 software version will display for approximately 3 seconds during the self-test. The RAD-40 will then display the altitude information.

7-3. Operation

1. Setting the Decision Height (DH)
 - a. Turn the rotary knob in the lower right corner of the RAD-40 display panel to set DH.
2. Adjusting the Display Intensity
 - a. Push and release the **MODE** button on the front of the display panel to enter brightness adjustment mode.
 - b. Rotate the knob on the front panel CW or CCW to the desired display intensity.
 - c. Push and release the **MODE** button to exit brightness adjustment mode.
3. The radar altimeter altitude becomes less sensitive as the altitude AGL increases as shown in Table 1.
4. The following system limitations may be encountered during normal operation.
 - a. Terrain - At altitudes above 1,500 feet AGL, terrain with poor reflectivity may cause the unit to unlock. Examples of unfavorable terrain are dry, loose soil, or sand.
 - b. Excessive Pitch/Roll - Above 1,500 feet AGL, the aircraft should be maintained within a 20-degree bank for proper operation. In general, below 1,500 feet AGL, a 30-degree bank is tolerated. An excessive pitch and roll attitude may cause the system to unlock.

- c. Above 2,500 feet AGL, the unit may unlock and attempt to relock causing erratic altitude output.
- d. Rapid Descent - The radar system provides normal operation at a descent rate of 1,500 feet per minute or less below 2,000 feet AGL. In cases of extremely rapid descent, both the response time of the system and pitch of the aircraft may prevent normal operation.
- e. Response Time - When flying over rapidly changing terrain, the system is limited by the 100 ms maximum response time of the unit.