



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Air Traffic Organization Policy

CHANGE 8
JO 6850.5C

Formerly 6850.5C
Effective Date:
08/15/2007

SUBJ: Maintenance of Lighted Navigational Aids

1. Purpose. This change gives revised pages to Order JO 6850.5C, Maintenance of Lighted Navigational Aids. This directive puts into action Configuration Control Decision (CCD) No. N31646, Revise Maintenance Handbook 6850.5C and Visual Guidance Lighting Systems Order 6850.2A to Allow Locally Established Aiming Angles for Visual Glide Slope Indicator Systems (VASI and PAPI).

2. Who This Change Affects.

a. This document is made available to sites with this Facility, Service, and Equipment Profile (FSEP): ALS, ARBCN, ETB, GDL, LDIN, MALS, MALSF, MALSR, ODALS, PAPI, REIL, SALR, SSALS, VASI.

b. For electronic copies, use the Technical Library website at <http://nas.amc.faa.gov>.

c. For printed copies, national offices distribute to sites with an accurate inventory record in FSEP and a mailing address in the Direct Distribution System (DDS).

d. For help in updating inaccurate FSEP and/or DDS records, visit our website at http://nas.amc.faa.gov/technical_library/template.jsp?bodyPage=help.html&title=Help.

e. FSEP distribution: 317A-E, 317G, 317H, 3511, 3515, 3291, 3150, 3140, 323A, 323C, 323F, 324A-D, 324F-G, 326A-C, 326E-H, 3181, 3191, 3192, 3193, 3194, 3195, 313A-C, 313E-G, 313H-K, 328B, 328F, 327B, 3161, 3162, 3163, 3164, 3165, 3166, 3167, 3168, 3169, 316A, 31AA, 31A-I.

3. Explanation of Changes. Modify Maintenance Handbook Order JO 6850.5C to allow the angles of the VASI and PAPI Light Housing Assemblies (LHAs) to be locally established per flight inspection results only when the LHAs cannot be adjusted within normal tolerances to satisfy the flight inspection requirements.

4. Disposition of Transmittal. Keep this change.

PAGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated
49	3/27/95	49	3/27/95
50 and 51	3/27/95	50 and 51	08/15/2007
52	1/31/96	52	1/31/96
61 and 62	03/19/2002	61	03/19/2002
		62	08/15/2007
95 and 96	3/27/95	95 and 96	08/15/2007



for Richard A. Thoma
Director, Safety and Operations Support

Section 1. APPROACH LIGHTING SYSTEMS (Continued)

<i>Parameter</i>	<i>Reference Paragraph</i>	<i>Standard</i>	<i>Tolerance/Limit</i>	
			<i>Initial</i>	<i>Operating</i>
→ 83. ODALS AND LDIN LIGHTS.				
a. Lamps Operational.				
(1) ODALS.....	314, 315	All lamps on	Same as standard	20 percent or less (random) of lamps out
(2) LDIN	314, 315	All lamps on	Same as standard	Locally established
b. Alignment Vertical and Horizontal.				
(1) ODALS.....	Instruction book	Light units plumb	Same as standard	Same as initial
(2) LDIN	Instruction book	Locally established	±1°	±2°
c. Flashing Rate.				
(1) ODALS.....	Instruction book	60 flashes per minute	±1 flash per minute	Same as initial
(2) LDIN	Instruction book	120 flashes per minute	±1 flash per minute	Same as initial
d. Operating Parameters	316			
e. Obstructions Due to Vegetation	348	No obstruction	Same as standard	Same as initial
84. LIGHT UNIT OR BAR LOCATION....	Order 6850.2A			
a. Longitudinal (Along Centerline).....		At station	±6 inches	±12 inches
b. Lateral (Perpendicular To Centerline).				
(1) Light bar		At station	±3 inches	±6 inches
(2) Light units.....		In line	±1 inch	±2 inches
c. Distance Between Individual Lights.				
(1) Medium intensity.				
(a) Centerline		2.5 feet	±1 inch	±3 inches

Section 1. APPROACH LIGHTING SYSTEMS (Continued)

Parameter	Reference Paragraph	Standard	Tolerance/Limit	
			Initial	Operating
(b) Threshold.....		10 feet	-0.0 feet, +1.0 feet	-0.0 feet, +1.0 feet
(2) High intensity				
(a) Centerline		40-1/2 inches	±1 inch	±3 inches
(b) Threshold.....		5 feet	±1 inch	±3 inches
(c) Side row.....		5 feet	±1 inch	±3 inches
d. Mounting Height Tolerance.				
(1) 0 to 6 feet.....		Light plane	±1 inch	±6 inches
(2) Above 6 to 40 feet.....		Light plane	±2 inches	±1 foot
(3) Above 40 feet.....		Light plane	±3 inches	±1 foot
85.-89. RESERVED.				

**Section 2. VISUAL APPROACH SLOPE INDICATOR AND
PRECISION APPROACH PATH INDICATOR**

Parameter	Reference Paragraph	Standard	Tolerance/Limit	
			Initial	Operating
→ 90. VASI AND PAPI LAMPS, OPERATIONAL.	320	All lights on	All lights on	A minimum of two lights on/box
→ 91. TWO-BAR VASI ANGULAR..... ELEVATIONS.	324			
* a. Downwind Bar (Bar No. 1).....		1/2° (30 minutes) below commissioned angle [See para. 324c(5)]	±2 minutes	±6 minutes
b. Upwind Bar (Bar No. 2).....		Commissioned angle [See para. 324c(5)]	±2 minutes	±6 minutes
→ 92. THREE-BAR VASI ANGULAR ELEVATIONS.	324			
a. Downwind Bar (Bar No. 1).....		Commissioned angle minus 0.25° (normally 2.75°) [See para. 324c(5)]	±2 minutes	±6 minutes
b. Middle Bar (Bar No. 2).....		Commissioned angle (normally 3.0°) [See para. 324c(5)]	±2 minutes	±6 minutes

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**Section 2. VISUAL APPROACH SLOPE INDICATOR AND
PRECISION APPROACH PATH INDICATOR (Continued)**

Parameter	Reference Paragraph	Standard	Tolerance/Limit	
			Initial	Operating
* c. Upwind Bar (Bar No. 2).....		Commissioned angle plus 0.25° (normally 3.25°) [See para. 324c(5)]	±2 minutes	±6 minutes
→ 93. PAPI ANGULAR ELEVATIONS.				
a. Standard Installation.....	324			
(1) Light unit 1 (unit nearest..... runway)		Commissioned angle plus 30 minutes [See para. 324c(5)]	±2 minutes	±6 minutes
(2) Light unit 2.....		Commissioned angle plus 10 minutes [See para. 324c(5)]	±2 minutes	±6 minutes
(3) Light unit 3.....		Commissioned angle minus 10 minutes [See para. 324c(5)]	±2 minutes	±6 minutes
(4) Light unit 4.....		Commissioned angle minus 30 minutes [See para. 324c(5)]	±2 minutes	±6 minutes
b. Installtions for Height Group 4..... Aircraft.	324, Order 6850.2A			
(1) Light unit 1 (unit nearest..... runway)		Commissioned angle plus 35 minutes [See para. 324c(5)]	±2 minutes	±6 minutes
(2) Light unit 2.....		Commissioned angle plus 15 minutes [See para. 324c(5)]	±2 minutes	±6 minutes
(3) Light unit 3.....		Commissioned angle minus 15 minutes [See para. 324c(5)]	±2 minutes	±6 minutes
(4) Light unit 4.....		Commissioned angle minus 35 minutes [See para. 324c(5)]	±2 minutes	±6 minutes
→ 94. VASI LIGHT-BOX HORIZONTAL ALIGNMENT.	324	Parallel to runway centerline ±1/2	Same as standard	Same as initial
→ 95. PAPI LIGHT-BOX HORIZONTAL ALIGNMENT.	324	Collinear with line perpendicular to runway centerline within 6 inches	Same as standard	Same as initial
→ 96. VASI LIGHT-BAR BOXES VERTICAL ALIGNMENT.	324	Within 2 minutes of each other	Same as standard	Same as initial

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**Section 2. VISUAL APPROACH SLOPE INDICATOR AND
PRECISION APPROACH PATH INDICATOR (Continued)**

Parameter	Reference Paragraph	Standard	Tolerance/Limit	
			Initial	Operating
→ 97. VASI TILT SWITCH OPERATION	323			
a. Upper Limit.....		Aiming angle +0.5° to 1°	Same as standard	Same as initial
b. Lower Limit.....		Aiming angle -0.25° to -0.5°	Same as standard	Same as initial
→ 98. PAPI TILT SWITCH OPERATION.....	323			
* a. Upper Limit.....		Aiming angle +0.5° to 1° (30 to 60 min.)	Same as standard	Same as initial
b. Lower Limit.....		Aiming angle -0.25° to -0.5° (-15 to -30 min.)	Same as standard	Same as initial
→ 99. PHOTOELECTRIC CONTROL	321			
a. Switching Time to High Intensity		Within one minute	Same as standard	Same as initial
b. Switching Time to Low Intensity		Within one minute	Same as standard	Same as initial
c. Orientation		Toward north sky	Same as standard	Same as initial
→ 100. THREE-STEP BRIGHTNESS..... SYSTEM REGULATOR OUTPUT CURRENT.	Instruction book			
a. High.....		6.6 A	+0 A, -0.2 A	Same as initial
b. Medium.....		5.2 A	+0.5 A, -0.2 A	Same as initial
c. Low.....		4.1 A	+0.8 A, -0.2 A	Same as initial
→ 101. TWO-STEP BRIGHTNESS..... SYSTEM LAMP CURRENT.	Instruction book			
a. High.....		6.4 A	±0.2 A	Same as initial
b. Low.....		4.5 A	+1.2 A, -0.3 A	Same as initial
102. INPUT VOLTAGE	Instruction book, Order 6950.17A	Rated input	±5 percent	±10 percent (for exceptions see Order 6950.17A)

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Section 1. PERFORMANCE CHECKS (Continued)
Subsection 3. MEDIUM-INTENSITY APPROACH LIGHTING SYSTEM -
(MALS, MALSF, MALSR)

<i>Performance Checks</i>	<i>Reference Paragraph</i>	
	<i>Standards and Tolerances</i>	<i>Maintenance Procedures</i>
181. MONTHLY Make visual operational checks of all lights, including flashers, on all brightness steps.	71c	306
* 182. QUARTERLY.		
a. Check SFL flash rate.....	78e	300
b. Check remote control function.....	79	306
183. ANNUALLY.		
a. Check all fixtures, including mirrors if installed, for vertical..... and horizontal alignment.	72, 73	308
b. Record meter readings.....	75, 78f	307, Order 6950.17A
184. RESERVED.		

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Subsection 4. ODALS AND LDIN

<i>Performance Checks</i>	<i>Reference Paragraph</i>	
	<i>Standards and Tolerances</i>	<i>Maintenance Procedures</i>
185. MONTHLY Make visual operational checks of all lights on all steps.	83	314
* 186. QUARTERLY	79	315
a. Check remote control functions.		
b. Record Meter Reading	83	316
187.-188 RESERVED.		

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Section 1. PERFORMANCE CHECKS (Continued)
Subsection 5. VASI AND PAPI

<i>Performance Checks</i>	<i>Reference Paragraph</i>	
	<i>Standards and Tolerances</i>	<i>Maintenance Procedures</i>
189. MONTHLY.		
a. VASI. Visually check operation of all lights and..... lamp box alignment.	90, 91, 92, 94, 96	320
b. PAPI. Visually check operation of all lights and..... lamp box alignment.	90, 93, 95	320
189-1. QUARTERLY.		
a. VASI. Check vertical and horizontal alignment..... of all light boxes.	91, 92, 94, 96	324
b. PAPI. Check vertical and horizontal alignment..... of all light boxes.	93, 95	324
190. SEMIANNUALLY.		
a. VASI.		
(1) Check operation of controls.....	99	321
(2) Record meter readings.....	100, 101, 102	322, Instruction book
(3) Check VASI-2 tilt switch	97	323
(4) Withdrawn - CHG 1		
b. PAPI.		
(1) Check operation of controls.....	99	321
(2) Record meter readings.....	101, 102	322, Instruction book
(3) Check PAPI tilt switches	98	323
* (4) Withdrawn by JO 6850.5C CHG 8)		
191. ANNUALLY.		
a. VASI. Check remote control functions (if applicable).....	105	321
b. PAPI. Check remote control functions (if applicable).....	105	321
192. RESERVED.		

- * 2 Set the leveling device dial to 0°.
- 3 With equal size blocks inserted under the channel of the aiming device bar near each end, the bubble should appear very near or at the center of the level tube.
- 4 Rotate the aiming device 180° on the blocks. The bubble should appear at the same relative position in the level tube.
- 5 If the bubble is not centered within two divisions on the level tube (each division is 1.2 minutes), recalibrate the device by adjusting the level tube until the bubble appears centered with the level dial at 0°.
- 6 The angular adjustment dial is now precisely calibrated.

(g) Vertical Alignment for Maximum Light Intensity Through the Aperture. The light meter and tripod are used to adjust the vertical alignment of the lamps for the maximum intensity through the aperture of the lamp housing assembly. Two light meters and tripods are required at each sector maintaining VASI systems. After an individual lamp replacement, an interim check for uniform lamp intensity is to visually inspect the LHA light output from approximately 700 feet downwind. Adjust the lampholders as required for uniform light output with maximum intensity.

1 Systems Having Individual Lampholder Adjustments. Remove the power from the lamp housing assembly (LHA). Disconnect the electrical wires from two of the lamps. Place and tape the light meter on the tripod. Place the light meter and tripod directly in front of the lamp that is electrically connected. Adjust the height until the light meter is at the height of the aperture. Place the tripod and light meter as close as possible to the aperture. If possible, place the meter partially into the aperture, but not touching the LHA. This position decreases the amount of background light read by the meter. Reapply power to the LHA and adjust the vertical alignment of the lampholder to obtain the maximum intensity. Tighten any loose alignment adjustment hardware. Remove power from the LHA and then disconnect the electrical wires from the lamp that was adjusted. Reconnect the electrical wires to one of the other unadjusted lamps. Move the light meter and tripod opposite this lamp, and repeat the procedure. Remove power from the LHA and disconnect the electrical wires from the second adjusted lamp and reconnect the electrical wires to the third lamp. Repeat the alignment procedure. Remove power from the LHA and reconnect the electrical wires to the other two aligned lamps. All three lamps should now be properly aligned for maximum intensity. Use this procedure for each of the other LHA's.

2 Systems Not Having Individual Lampholder Adjustments. Place and tape the light meter on the tripod. Place the light meter and tripod in front of the LHA at the center of the aperture. Adjust the height until the light meter is at the height of the aperture. Place the tripod and meter as close as possible to the aperture. If possible, place the meter partially into the aperture, but not touching the LHA. This position decreases the amount of background light read by the meter. The maximum light intensity through the aperture occurs when the lamps are tilted downward approximately 1.8° from the center line of the lamps and the aperture. This small change of 1.8° will increase the intensity by approximately 56 percent from zero-degree tilt. The alignment of the lamps is dependent upon the position of the bulkhead. Remove either the bolts or screws at the top or bottom where the bulkhead is fastened to its mounting brackets. The entire bulkhead can be repositioned from the vertical allowing the lamps to tilt downward. Site adaptation may be required for each system. With the lamps on, monitor the light meter, and tilt the bulkhead to produce the maximum light intensity through the aperture. Use washers as shims to reposition the bulkhead. Site adaptation may be required for each LHA. After repositioning the bulkhead, replace mounting hardware. Repeat the procedure for other LHA's.

(4) Check the vertical alignment of the PAPI lamp housing assemblies and adjust if necessary. Refer to the PAPI manufacturer's instruction manual for proper use of the PAPI aiming device and the alignment procedures.

(5) Adjusting LHAs angles to comply with flight inspection. If a flight inspection conducted in accordance with latest version of 8200.1 indicates that the pilot-perceived angle for a VASI or PAPI does not comply with the allowable flight inspection tolerances, the LHA aiming angles may be adjusted to satisfy the flight inspection requirements. This should be done only as a last resort after the angles have been rechecked with the aiming device and all other avenues have been exhausted (especially part 3(g) above for VASIs). The aiming angle established in this fashion shall be recorded as the locally established aiming angle, and the tolerances specified in chapter 3 shall apply to that angle.

(a) For clarification, note that this process is not changing the commissioned angle of the system, but rather it is changing the aiming angle of the LHAs to achieve the commissioned angle. Also, Flight Inspection's final measurement of the composite angle vs. the desired commissioned angle, must be within the tolerance specified in FAA Order 8200.1. The Flight Inspection composite angle is not subject to the individual LHA angle setting tolerances specified in this order.

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* (b) For VASIs, all LHAs shall be adjusted by the same amount. For example, if a flight inspection of a VASI indicates that the aiming angle is 0.15° (9') too high, the angle of all four LHAs shall be decreased by 0.15° (9'). The flight inspection shall be repeated after the adjustment to verify that the flight check glide angle is now within Flight Inspection tolerance.

(c) For PAPIs, each LHA shall be adjusted by the amount of error indicated by the flight inspection. For example, if a flight inspection indicates that a LHA was aimed too low by 0.15° (9'), that LHA only shall be raised 0.15° (9'). The flight inspection shall be repeated after the adjustments to verify that the perceived flight check angle for each LHA and the composite glide angle are within Flight Inspection tolerance.

(d) For both VASI and PAPI, the final angle established for each LHA shall become the locally established angle. These angles shall be recorded on FAA Form 6030-17 and placed in section 4 of the FRDF. The angles shall also be marked permanently on the exterior of the LHAs.

(6) Events that require a flight inspection. The following events require a flight inspection before a VASI or PAPI system may be returned to service:

- Replacement of a LHA
- Relocation of the system
- Any time a LHA requires more than 0.2° (12 minutes) of adjustment to bring it back to the required angle.
- The reference angle marked on any LHA is not legible and the angle can not be found in the site records.

**325. PAPI LAMP FAIL CIRCUITRY TESTING
Withdrawn - Chg 7**

326.-328. RESERVED.

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