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Evaluation of Intensity Distribution Profiles for U.S. Army Rotorcraft Position Lighting Adapted for Image Intensifier Operations

By

Ellen H. Snook
Clarence E. Rash

Sensory Research Division

and

Malcolm N. Colbert
Night Vision Device Branch
U.S. Army Aviation Training Brigade

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Compatibility problems with image intensifier (I^2) devices and cockpit/interior lighting have been investigated and well documented. However, I^2 compatibility with position/exterior lighting is only in the early stages of development. In the Army aviation community, attempts have been made to reduce the detrimental effects of position light intensity on I^2 devices by operating lights in dim mode or by masking lights. In these modified lighting configurations, requirements in Federal Aviation Administration (FAA) regulations are not always satisfied. In this investigation, the intensity distribution profiles for currently employed lighting strategies were evaluated. Further subjective evaluation of the entire position light system, as a whole, is strongly recommended in order to determine all factors that may have impact on the modification of exterior lighting and/or requirements. Exterior lighting must be acceptable in both the civilian/military aviation environments.

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Introduction

Image intensification (I^2) technology has greatly enhanced U.S. Army aviation night operations since its acceptance into Army aviation's rotary-wing program. However, aircraft interior and exterior lighting can cause problems due to the I^2 device's inability to distinguish between light originating from the outside scene and light originating from other sources within its field-of-view (i.e., cockpit lighting, aircraft position lighting, and other auxiliary lighting). Such coincidental sources can cause a degradation in the resulting image, to the extent that visual information may be lost.

The compatibility problems associated with cockpit/interior lighting have been well documented, and alternative lighting techniques and devices have been investigated (Rash and Verona, 1989; Rash and Martin, 1991; Rash and Snook, 1992). MIL-L-85762A (Lighting, aircraft, interior, NVIS compatible) establishes night vision imaging systems (NVIS) compatibility requirements for cockpit/interior lighting. MIL-L-6503H (Lighting equipment, aircraft, general specification for installation of) is the primary exterior lighting specification used by the Army. This latter specification has not been revised to take into account present mission and training requirements in the I^2 environment. Exterior lighting compatibility problems have been recognized, but only limited technical evaluations have been performed. The Department of the Navy recognized exterior lighting compatibility problems during the Research, Development, Test, and Evaluation (RDT&E) of the A-12 program (Kinney and Simpson, 1992), and developed test procedures for evaluating lighting compatibility in an effort to integrate exterior lighting for I^2 operations. In 1990, the U.S. Army Aviation Training Brigade (ATB), Fort Rucker, Alabama, informally surveyed Army aviation field units to identify problems experienced with rotorcraft-mounted exterior lighting used during I^2 operations. Problems identified are summarized in Table 1 by rotorcraft type and light type. Table 2 specifies the numbers, colors, and locations for rotorcraft position lights as designated in applicable Army technical manuals (TMs).

In attempts to minimize the degradation of I^2 performance, modifications have been made to position lighting in Army aviation tactical and training environments. Dim mode operation of position lighting on Army rotorcraft is available to reduce the overall intensity of exterior lighting. Masking configurations also have been developed to decrease intensity and angular distribution of position lighting. Masking is achieved through taping or painting of the glass dome covering the position lights at specific areas where emitted light may enter the crew

Table 1.

Problems identified with rotorcraft exterior lighting when using I^2 devices.

Rotorcraft type	Left (red) lateral position light	Right (green) lateral position light	Rear (white) tail position light
UH-1	Too bright for formation flight.	No problems identified.	Too bright for formation flight.
UH-60	Too bright, creates excessive glare in aircraft crew compartment.	No problems identified.	Too bright for formation flight.
OH-58	Too bright for formation flight.	No problems identified.	Too bright for formation flight.
AH-1	Too bright, tends to draw attention of crew. Puts right side of aircraft in shadow.	No problems identified.	No problems identified.

Table 2.

Position light designations on U.S. Army rotorcraft.

Rotorcraft type	Position lights
UH-1	Eight visible units; two red on left above and below cabin door; two green on right above and below cabin door; two white on top of fuselage just inboard of red and green lights; one white on bottom center of fuselage; one white on tailboom vertical fin.
UH-60	Three visible units; one red on left and one green on right outboard of landing gear support; one white on top of tail pylon.
OH-58	Three visible units; one red on left tip of horizontal stabilizer; one green on right tip of horizontal stabilizer; one white on aft end of tail boom.
AH-1	Four visible units; one red on left wing tip; one green on right wing tip; two white, one on either side of tail boom.

compartment and distract trailing aircraft in formation. Figure 1 depicts proposed masking configurations for lateral and rear position lights. While dim mode operation and partial masking of position lights reduce degradation of I^2 imagery, this modified lighting becomes suspect with regard to continuing compliance with requirements established by the Federal Aviation Administration (FAA) for light distribution and intensities. Specifications in MIL-L-6503H are based upon these requirements.

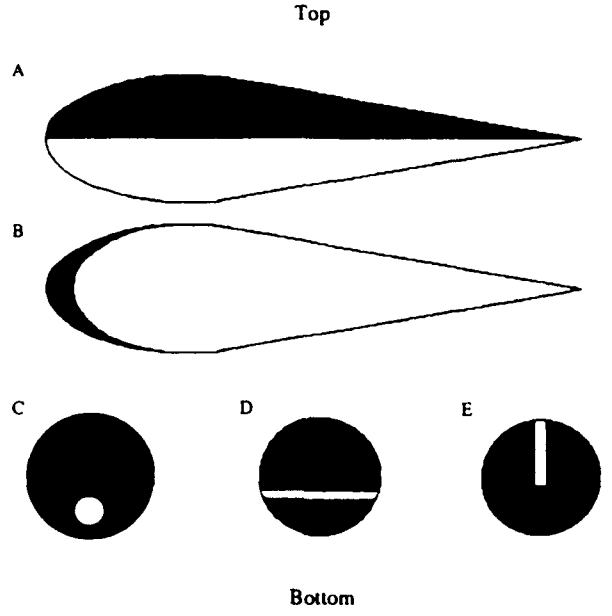

Figure 1. Proposed masking configurations for lateral and tail position lights.

The FAA defines requirements for exterior lighting angular distribution and intensities to ensure that aircraft flying in civil airspace have sufficient exterior lighting to provide aircraft position information. Intensity distribution requirements are defined for aircraft position (lateral and rear) lights to augment visibility of air traffic from all angles. Paragraphs 1387 through 1393 of Federal Aviation regulations (FAR), sections 27 and 29 specify requirements for: position light system dihedral angles, position light distribution and intensities, minimum intensities in the horizontal plane of forward and rear position lights, and minimum intensities in any vertical plane of forward and rear position lights, respectively. Table 3 summarizes the required light intensities at specified dihedral angles for position lights as defined in the FARs. In general, the specifications state that position lights shall provide their greatest intensities in the forward (lateral) and rear directions of the aircraft during flight.

Table 3.

Minimum intensity distribution requirements for aircraft position lighting.

Horizontal angle	Minimum horizontal intensity (cd)	Vertical angle	Minimum vertical intensity (cd)
Lateral position light:			
0° to 10°	40.0	0°	40.0 (1.0 x)
		5°	36.0 (0.9 x)
		10°	32.0 (0.8 x)
		15°	28.0 (0.7 x)
		20°	20.0 (0.5 x)
		30°	12.0 (0.3 x)
		40°	4.0 (0.1 x)
		90°	2.0 (0.05x)
10° to 20°	30.0	0°	30.0 (1.0 x)
		5°	27.0 (0.9 x)
		10°	24.0 (0.8 x)
		15°	21.0 (0.7 x)
		20°	15.0 (0.5 x)
		30°	9.0 (0.3 x)
		40°	3.0 (0.1 x)
		90°	1.5 (0.05x)
20° to 110°	5.0	0°	5.0 (1.0 x)
		5°	4.5 (0.9 x)
		10°	4.0 (0.8 x)
		15°	3.5 (0.7 x)
		20°	2.5 (0.5 x)
		30°	1.5 (0.3 x)
		40°	0.5 (0.1 x)
		90°	0.25 (0.05x)
Tail position light:			
0° to 70°	20.0	0°	20.0 (1.0 x)
		5°	18.0 (0.9 x)
		10°	16.0 (0.8 x)
		15°	14.0 (0.7 x)
		20°	10.0 (0.5 x)
		30°	6.0 (0.3 x)
		40°	2.0 (0.1 x)
		90°	1.0 (0.05x)

Note: Horizontal angles are to left/right of vertical plane, vertical angles are above/below horizontal plane.

The requirements listed in Table 3 were developed prior to the introduction of I^2 devices into aviation and are based on unaided (naked eye) viewing. In an I^2 environment, the spectral distribution and intensity requirements for aircraft exterior lighting can be detrimental and result in hazardous flying conditions. Army Regulation (AR) 95-2, paragraph 9-2, stipulates only limited exceptions for night vision device flight training in U.S. Army tactical helicopters operating in the National Airspace System (NAS). A FAA grant of exemption permits lights-out operations in certain phases of night vision device training within well-defined and controlled areas when two or more rotorcraft are involved, and with advanced coordination with other nonparticipating parties. For all other areas in the NAS, authorization may be given for position lights to be on dim at altitudes up to 400 feet above ground level (AGL). Problems arise when aided formation flights, operating with modified lighting (masked or dimmed lighting), transition from military airfields to training areas at altitudes above 400 AGL in compliance with local noise abatement practices. In these situations, there are concerns that unaided civilian traffic cannot visually acquire and appropriately respond to aircraft operating with modified lighting configurations.

The Night Vision Device Branch (NVDB) of ATB is seeking to develop standardized methods for achieving lighting configurations which minimally degrade I^2 devices, while remaining within FAA regulations. ATB has requested that the U.S. Army Aeromedical Research Laboratory (USAARL) investigate the intensity distribution profiles of proposed masked position lighting configurations using criteria specified by the FAA. The original request, shown in Appendix A-1, asks for an evaluation of masked configurations for the aircraft position and anticollision lights. During preliminary test development, the anticollision light evaluation was eliminated due to the relatively small impact of this light and time limitations. The evaluation of dim mode intensity profiles was added. An amended tasking letter is shown in Appendix A-2.

This laboratory investigation evaluates the intensity distribution profiles of position lighting for the UH-1, UH-60, OH-58A, and AH-1 rotorcraft in dim mode and in proposed masked configurations. Baseline intensity distribution profiles were measured for each position light type operating in standard bright mode. Measured intensity profiles are compared to FAA requirements to determine the acceptability of dim mode operation and the impact of masking on light intensity distributions.

Methodology

Test Items

Two lateral and three tail position light units were supplied from four types of U.S. Army rotorcraft currently in use. Some position light fixture types are shared by multiple aircraft. Figure 2 shows lateral position light fixtures; the fixture shown on the left is used for the OH-58D and UH-60 rotorcraft, and the fixture shown on the right is used for the UH-1, OH-58A or C, and AH-1 rotorcraft. Figure 3 shows tail position light fixtures; the fixture shown on the left is used for the OH-58A, C, or D and AH-1 rotorcraft, the fixture shown in the center is used for the UH-1 rotorcraft, and the fixture shown on the right is used for the UH-60 rotorcraft. National stock numbers (NSNs) for the position light fixture types provided are listed in Table 4.

The lateral position light fixtures are identical for the left and right sides of the aircraft. When installed on the aircraft, the left and right fixtures mirror each other in orientation, and the left side orientation is configured with a red-colored dome filter while the right side orientation is configured with a green-colored dome filter.

One fixture is provided for the OH-58D/UH-60 lateral position light along with five different dome configurations. An unmasked dome configuration is provided in red and green colors. Figure 1a depicts a half-masked dome configuration also provided in red and green colors, and Figure 1b depicts a front-masked dome configuration provided in red only. Flat olive drab color paint is used to mask the inside surface of the half-masked dome, and flat gunmetal color paint is used to mask the outside surface of the front masked dome. Two fixtures are provided for the UH-1/OH-58A or C/AH-1 lateral position light along with two dome configurations, unmasked red and unmasked green. One fixture each is provided for the UH-1 and UH-60 taillights, and two fixtures are provided for the OH-58A, C, or D/AH-1 taillight. The taillight fixtures are configured with clear domes. Figure 1c depicts one proposed masked dome configuration provided for the OH-58A, C, or D/AH-1 tail position light. Green duct tape is used to mask the outside surface of the clear dome.

Each lateral position light fixture type uses a different bulb type. The OH-58D/UH-60 lateral position light uses a single filament, 40-watt bulb; and the UH-1/OH-58A or C/AH-1 lateral position light uses a single filament, 26-watt bulb. Table 4 lists the NSNs for the bulbs used in these fixture types. The two lateral position light bulb types have different reflector configurations. These configurations, shown in Figure 4,

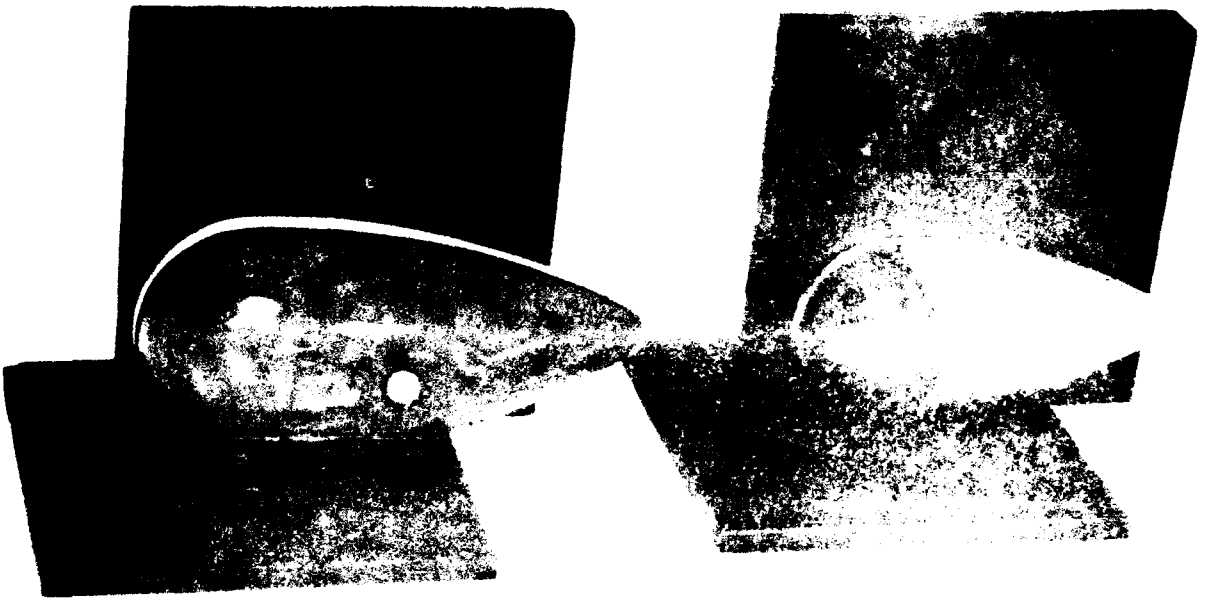

Figure 2. OH-58D/UH-60 and UH-1/OH-58A [illegible] position light fixtures (left to [illegible].

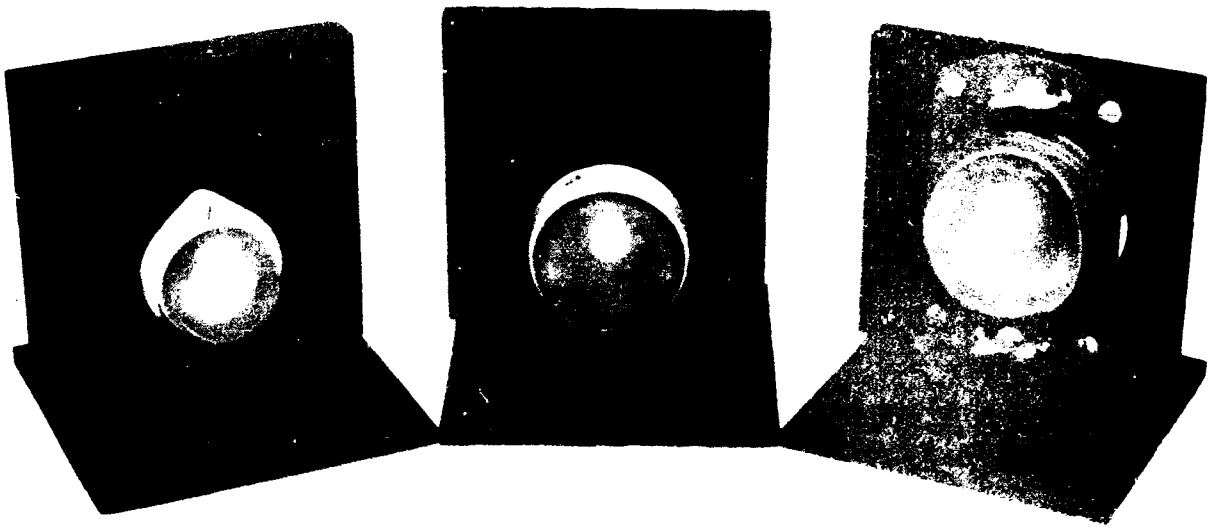

Figure 3. OH-58A, C, or D/AH-1, UH-1, and [illegible] light fixtures (left to right).

Table 4.

National stock number references
for position light fixtures and bulbs.

Rotorcraft type	Lateral fixtures	Lateral bulbs	Tail fixtures	Tail bulbs
UH-1	6220-00-283-9337	6240-00-681-8366 6240-01-262-0148	6220-00-828-4209	6240-00-044-6914
UH-60	6220-01-236-9814	6240-00-592-1006 6240-01-262-5787	6220-01-109-7379	6240-00-044-6914
OH-58A/C	6220-00-283-9337	6240-00-681-8366 6240-01-262-0148	6220-00-548-0313	6240-00-044-6914
OH-58D	6220-01-236-9814	6240-00-592-1006 6240-01-262-5787	6220-00-548-0313	6240-00-044-6914
AH-1	6220-00-283-9337	6240-00-681-8366 6240-01-262-0148	6220-00-828-4209	6240-00-044-6914

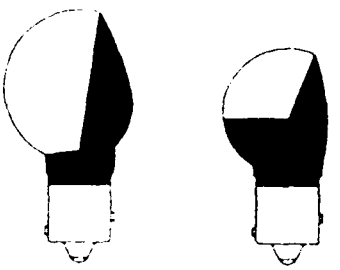

Figure 4. Grimes type II and type III reflector configurations for lateral position light bulbs.

are designated type II (OH-58D/UH-60) and type III (UH-1/OH-58A or C/AH-1) by the bulb manufacturer, Grimes Aerospace Corporation*. All tail light types use the same dual filament, 25-watt bulb (Table 4). All position light bulbs have a rated voltage of 28 volts direct current (VDC) and are manufactured to specifications in MIL-L-6363F (Lamps, incandescent, aircraft service, general specification for).

*See Appendix B.

For single sample intensity profile measurements, one appropriate bulb type was supplied with each fixture type. Because there is possibility for variation in intensity profiles among bulbs of the same type, multiple samples of each type also were supplied. Fourteen samples each were supplied for the type II and III lateral position light bulbs, and 13 samples were supplied for the tail position light bulb. All bulbs were received new. Two 6.8 ohm resistors (MIL RW22V6R8) also were provided to simulate dim mode operation of the position lights. The resistors, light units, bulbs, and domes used in this investigation were supplied by training units at Fort Rucker.

Methods

Measurement parameters

Light intensity is the luminous flux emitted from a point source, where light flux is the rate of flow of visible energy. Intensity measurement of a light source generally is performed indirectly with instrumentation which measures illuminance. Illuminance is the density of luminous flux incident upon a surface. Intensity of a point light source can be calculated from illuminance using the inverse square law:

$$\text{Illuminance (footcandles)} = \frac{\text{intensity of source (candelas)}}{\text{distance (feet)}^2}$$

A technical definition for the relationship between intensity and illuminance is given in Appendix C.

To determine the intensity profiles for the different light units with respective dome configurations, measurements were made at horizontal and vertical angle combinations based on those stipulated in the FARs. Figure 5 defines the horizontal and vertical angular positions (with respect to the rotorcraft) and specifies the minimum intensity distribution requirements. In the horizontal direction, the highest minimum intensities are required between 0 to ±20 degrees; beyond that, the intensity requirements drop off sharply. In the vertical direction, the highest minimum intensity is required at 0 degrees with respect to the horizontal plane of the aircraft centered at the lamp filament. At positions above and below 0 degrees vertical, the intensity requirements drop off as multiples of the highest value. Based on the distribution of intensity requirements, a critical region for the lateral position lights can be defined as the cone between 0 to ±20 degrees in the horizontal and vertical angular directions. A critical region is not defined for the tail position lights because a constant minimum intensity value is specified across the horizontal direction.

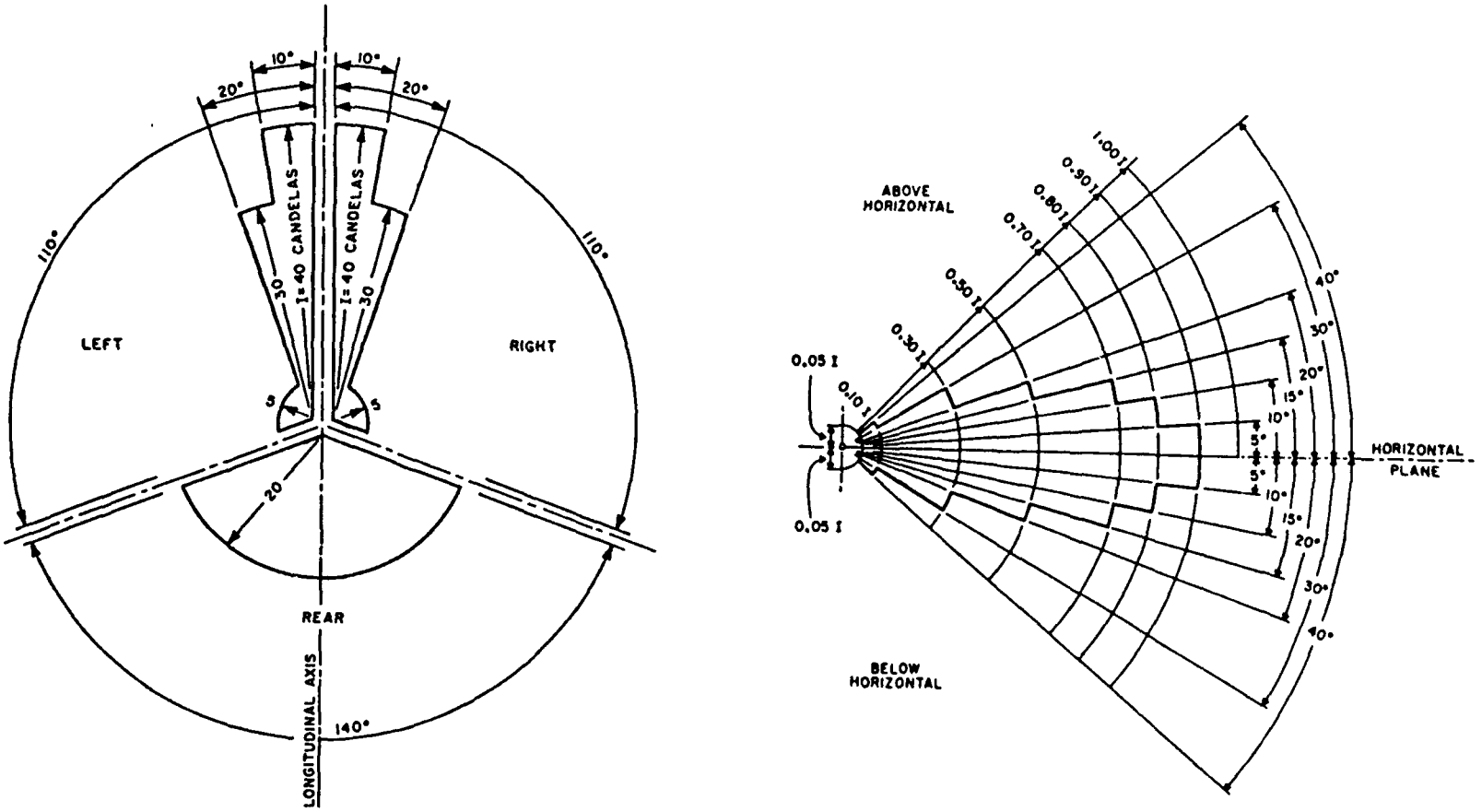

Figure 5. Position light horizontal and vertical angular definitions and minimum intensity distribution requirements.

Based on the minimum intensity requirement profile for the lateral position lights, measurements in the horizontal direction were made at 5 degree increments in the critical region; outside the critical region, the increment was extended to 20 degrees. Measurements were made in the horizontal direction at angles of 0, 5, 10, 15, 20, 40, 60, 80, 100, and 110 degrees with respect to the filament of the lamp. In the vertical direction, measurements were made at each of the angles stipulated in the FARs (Table 3) with the exception of 90 degrees vertical due to an instrument limitation which allowed measurement only to 75 degrees vertical. A measurement at 75 degrees vertical was acceptable because the same minimum intensity value is required between 40 and 90 degrees in the vertical direction. Table 5a shows a matrix for horizontal and vertical angle combinations where intensity data were collected for the lateral position lights.

Measurements for the tail position light were made in larger increments of 20 degrees since the intensity requirement remains constant throughout the horizontal direction. Measurements were made in the horizontal direction at angles of 0, 20, 40, 60, and 70 degrees in the clockwise and counterclockwise directions. Vertical direction measurements were made at those angles stipulated in the FARs, again with the exception of 90 degrees vertical. Table 5b shows a matrix for horizontal and vertical angle combinations where intensity data were collected for the tail position lights.

Table 5a.

Measurement position angles for lateral position lights.

		Horizontal angle (cw/ccw)									
		0	**5**	**10**	**15**	**20**	**40**	**60**	**80**	**100**	**110**
	0	(0,0)	(5,0)	(10,0)	(15,0)	(20,0)	(40,0)	(60,0)	(80,0)	(100,0)	(110,0)
Vertical	**5**	(0,5)	(5,5)	(10,5)	(15,5)	(20,5)	(40,5)	(60,5)	(80,5)	(100,5)	(110,5)
angle	**10**	(0,10)	(5,10)	(10,10)	(15,10)	(20,10)	(40,10)	(60,10)	(80,10)	(100,10)	(110,10)
	15	(0,15)	(5,15)	(10,15)	(15,15)	(20,15)	(40,15)	(60,15)	(80,15)	(100,15)	(110,15)
	20	(0,20)	(5,20)	(10,20)	(15,20)	(20,20)	(40,20)	(60,20)	(80,20)	(100,20)	(110,20)
(top/bottom)	**30**	(0,30)	(5,30)	(10,30)	(15,30)	(20,30)	(40,30)	(60,30)	(80,30)	(100,30)	(110,30)
	40	(0,40)	(5,40)	(10,40)	(15,40)	(20,40)	(40,40)	(60,40)	(80,40)	(100,40)	(110,40)
	75	(0,75)	(5,75)	(10,75)	(15,75)	(20,75)	(40,75)	(60,75)	(80,75)	(100,75)	(110,75)

Table 5b.

Measurement position angles for tail position lights.

		Horizontal angle (cw/ccw)				
		0	20	40	60	70
	0	(0,0)	(20,0)	(40,0)	(60,0)	(70,0)
Vertical	5	(0,5)	(20,5)	(40,5)	(60,5)	(70,5)
angle	10	(0,10)	(20,10)	(40,10)	(60,10)	(70,10)
	15	(0,15)	(20,15)	(40,15)	(60,15)	(70,15)
	20	(0,20)	(20,20)	(40,20)	(60,20)	(70,20)
(top/bottom)	30	(0,30)	(20,30)	(40,30)	(60,30)	(70,30)
	40	(0,40)	(20,40)	(40,40)	(60,40)	(70,40)
	75	(0,75)	(20,75)	(40,75)	(60,75)	(70,75)

Sample size

Measurements were made on a single sample of each light fixture type for all dome configuration provided. In these measurements, for each light fixture type in all possible configurations, an appropriate bulb type was used. Variation is expected in the intensity profiles among bulbs of the same type. To determine how much variation occurs, a separate multiple bulb sample evaluation was performed. In this followup evaluation, multiple samples of each bulb type were measured for only one configuration each because of the time required to complete profile measurements. An analysis of variance was performed on multiple sample data to determine the amount of variability among bulbs of each type.

Instrumentation

Measurement instrumentation

Illuminance was measured with a Photo Research* Spectra® Pritchard model 1980A-PL photometer with a 7 inch, f/3.5 objective lens and IB-80 illumination baffle; measurements were validated with a Minolta* model T-1H illuminance meter. The photometer was supported on a motor-driven platform which positioned the instrument horizontally and vertically. An Optron* Hercules model 5292 tripod, marked in angular increments for pan (horizontal rotation) and tilt (vertical rotation), was used as a platform for the light fixtures to achieve horizontal and vertical angular positions. Direct current (DC) power was supplied through a Hewlett-Packard* model 6291A DC power supply. A Fluke* model 8020B multimeter was used to verify the operating voltage at the light source.

Position light mounting fixtures

Two mounting fixtures in opposing orientation were designed and fabricated for each of the lateral position lights, and mounting fixtures were designed and fabricated for the tail position lights to simulate appropriate orientation on the rotorcraft and to provide repeatability of setup. The mounting fixtures were constructed of two pieces of plywood with dimensions of 4-inches by 4-inches by ¼-inch. One piece was drilled through the center with a ¼-inch hole for tripod mounting. A second piece was drilled through with a hole large enough to accommodate the back side of the light fixtures, and as low as possible to minimize unwanted angular displacement when rotated in the vertical direction (tilt). To mount the light fixtures in place, additional holes were drilled in the second piece to coincide with existing holes in the fixtures. The two pieces were attached perpendicularly so that, when the light unit was installed in the mounting fixture, its orientation corresponded to that on the airframe, and the bulb filament was located directly over the center of horizontal rotation (pan) of the tripod. Figure 6 shows a lateral position light unit attached to its mounting fixture and positioned on the tripod. The mounting fixtures were painted flat black to minimize reflection of light.

Positioning devices

The mounted light units were positioned on a tripod marked in 1-degree angular increments of pan and tilt. For horizontal rotation (pan), the tripod could be rotated ±360 degrees. For vertical rotation (tilt) the tripod could be rotated only to 75 degrees. Therefore, to measure the top and bottom halves of each bulb, the light units were physically removed from the mounting fixture and rotated 180 degrees. For the lateral position light units, two opposite mounting fixtures were used to properly orient the light on the tripod.

The photometer head was mounted to a motor driven horizontal translator designed specifically to support it. Figure 7 shows the setup of the photometer and tripod for light measurements. Once positioned, the distance between the photometer and the tripod was maintained. The walls and floors surrounding the measurement area were covered with black cloth to minimize reflection of light.

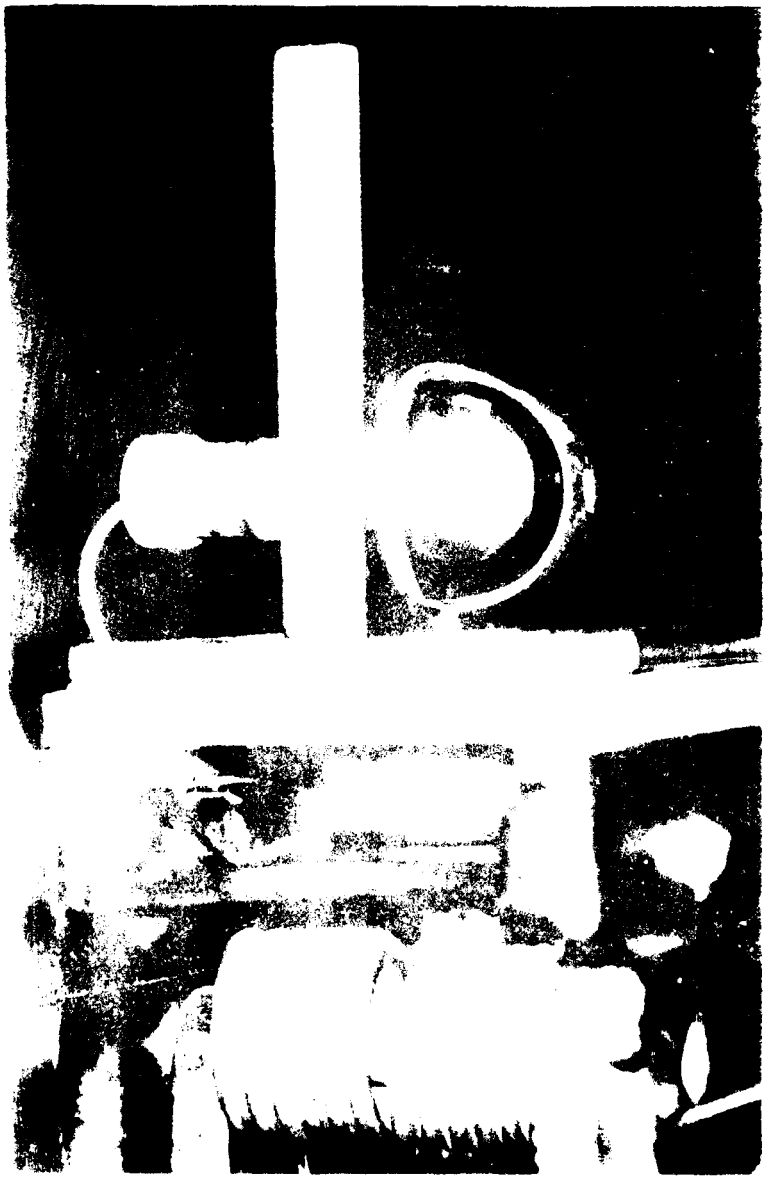

Figure . Lateral position light unit installed in mounting fixture, positioned at (0,0) on tripod.

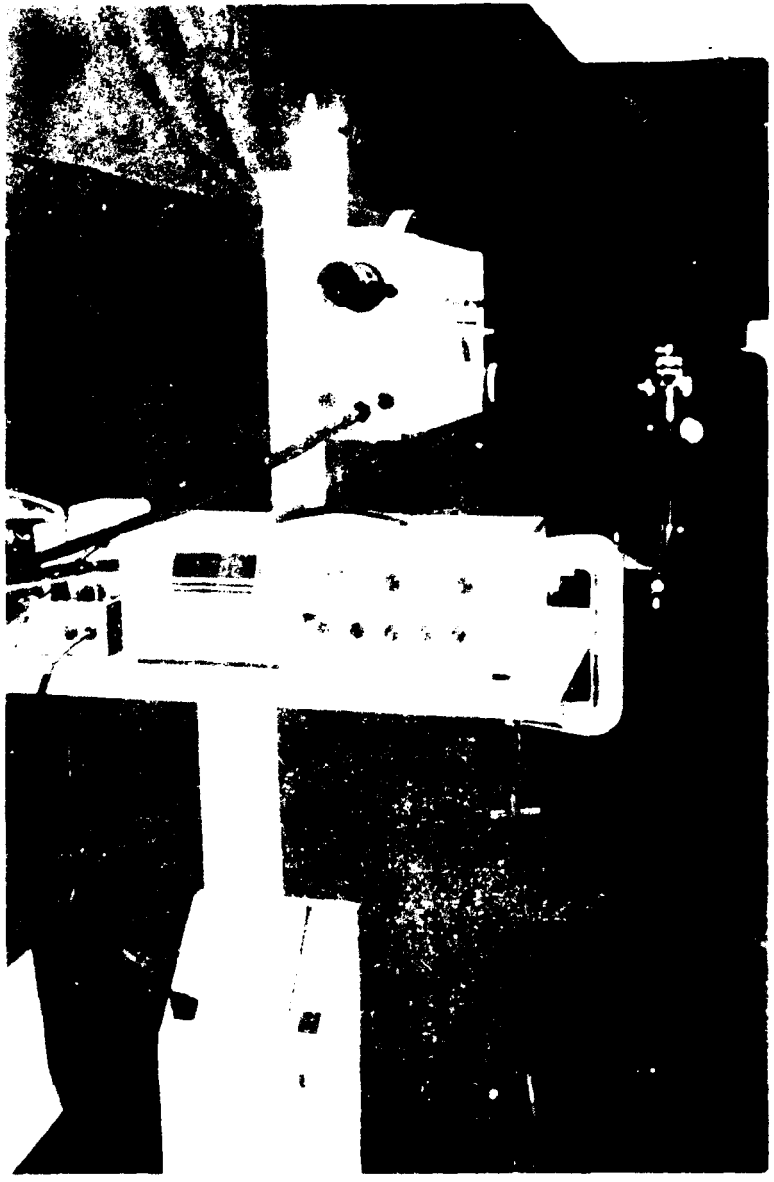

Figure . Laboratory set up for photometric measurements.

Procedures

General measurement procedures

Illuminance measurements were made using a 3-degree aperture and illuminance baffle with the photometer. The prescribed methods for instrument set up and calibration were followed. The calibration factor for the IB-80 illuminance baffle is 1×10^{-3}. The photometer was calibrated prior to measurement of each light unit and each bulb sample. Each bulb sample was inspected visually prior to measurement. Both the general condition of any reflective coating and the glass dome as well as the orientation of the filament were noted.

At least two operators were required to perform the intensity profile measurements. One operator positioned the light unit on the tripod and another aligned the photometer aperture with the bulb filament with the setting of each angular position. A light unit was set in place on the tripod by squaring the bottom edges of its mounting fixture with the top plate of the tripod and securing it with the tripod mounting screw. The zero point on the tripod was adjustable so initial "zero" alignment was performed by having the photometer operator observe through the viewing eyepiece while the tripod mounted light unit was displaced equally in small horizontal increments to either side of an approximate "zero" point. When the horizontal displacements appeared equivalent about a "zero" point, that point was locked in place. This zero alignment point on the tripod remained fixed throughout the measurements since all mounting fixtures were designed to position the light bulb filaments directly over the horizontal center of rotation of the tripod.

The initial measurement position was made at the "zero-zero" position. At this position, distance was measured, in feet, from the filament of the bulb to the objective lens of the photometer. Intensity measurements were made in consecutive sequences of horizontal and vertical angles. The first measurement was made at (0,0) (horizontal angle, vertical angle); the next was at (0,5); then at (0,10), and so on, to (0,75). Once the 0 degree horizontal series was completed, the 5 degree horizontal series was measured, and so on, until all the horizontal series were measured.

Left side (red dome) configured light units were rotated to the clockwise direction horizontally when measuring the top half of an intensity profile. To measure the bottom half of a profile, the same light unit was placed in an opposite mounting

fixture and rotated to the counterclockwise horizontal direction. The right side (green dome) configured light units were just opposite of the left side. Therefore, they were rotated to the counterclockwise direction when measuring the top and the clockwise direction for measurement of the bottom intensity profile. There was only one orientation for the tail position light units. These units were rotated 180 degrees in the same mounting fixture to measure top and bottom profiles in the clockwise and counterclockwise directions. The clockwise direction was designated by positive angular values, and the counterclockwise direction was designated by negative angular values.

Ideally, the bulb filament (center of the light source) should have been placed at the center of rotation of the tripod in order to eliminate angular displacement. However, this position could not be achieved so, as a light unit was displaced vertically and horizontally in angular combinations, minor adjustments were required to keep the bulb filament centered within the photometer aperture. Any vertical adjustments were made at the tripod and any horizontal adjustments were made with the photometer translator.

When data for a complete illuminance profile were collected, intensity values were calculated by multiplying each illuminance value by the calibration factor for the illuminance baffle (1×10^{-3}) and by the distance squared between the objective lens of the photometer and the filament of the light source. The initial intensity values then were verified with the illuminance meter. Intensity was calculated from these values (in candela units) by multiplying distance squared between the light source filament and the measuring plane of the illuminance meter.

Single sample measurement procedures

Intensity profiles for one of each light fixture type and corresponding dome configuration were measured with an appropriate bulb type operating in both bright and dim modes. Table 6 lists all light units and corresponding dome configurations measured in this single sample evaluation. A total of 11 different configurations were measured in bright mode: 5 configurations for the OH-58D/UH-60 lateral position light, 2 configurations for the UH-1/OH-58A or C/AH-1 lateral position light, 2 configurations for the OH-58A, C, or D/AH-1 tail position light, and 1 configuration each for the UH-1 and UH-60 tail position lights. A total of eight different configurations were measured in dim mode: two each for the OH-58D/UH-60 and UH-1/OH-58A or C/AH-1 lateral position lights, two for the OH-58A, C, or D/AH-1 tail position light, and one each for the UH-1 and UH-60 tail position lights.

Table 6.

Lateral and tail position light configurations profiled in this evaluation.

Light type	Bright mode	Dim mode
Lateral position lights		
OH-58D/UH-60	Red unmasked Red half-masked Red front-masked Green unmasked Green half-masked	Red unmasked Green unmasked
UH-1/OH-58AC/AH-1	Red unmasked Green unmasked	Red unmasked Green unmasked
Tail position lights		
UH-1	Clear unmasked	Clear unmasked
UH-60	Clear unmasked	Clear unmasked
OH-58ACD/AH-1	Clear unmasked Clear masked	Clear unmasked Clear masked

Bright mode measurement procedures

Bright mode was defined as operation at the normal operating voltage of the rotorcraft which was 28 VDC. Bright mode operation was simulated in the laboratory with a DC power source set to deliver 28 VDC at the light unit. The voltage was verified with a multimeter. To monitor any incidental changes in voltage, a measurement was made and recorded prior to each light sample measurement. Intensity profile measurements proceeded as described previously.

Dim mode measurement procedures

Dim mode is selected in the rotorcraft via a three-position switch. When switched to dim mode, a 6.8 ohm resistor is connected in series between the power source and the light unit. In the laboratory, an actual rotorcraft resistor was connected in line between the DC power source and the light unit. Before connecting the resistor, a voltage measurement was made at the light source to verify that the power source was delivering 28 VDC. With the resistor in line and power on, the effective voltage delivered to the light units was measured and recorded. Intensity profile measurements proceeded as previously described.

Multiple sample measurement procedures

Multiple bulb samples were measured to determine the amount of variability among bulbs of the same type. This set of bulb samples was independent of those used in the single sample measurements, and was measured solely for the purpose of determining variation among the same type bulbs. The two lateral position light types (OH-58D/UH-60 and UH-1/OH-58A or C/AH-1) use different bulb types; all tail position light types use the same bulb type. All multiple sample measurements were made with light units in one configuration for each bulb type. Each lateral position light type was configured with an appropriate red, unmasked dome operating in dim mode. The tail position light type was configured with a clear, unmasked dome operating in dim mode in an OH-58A, C, or D/AH-1 tail position light fixture.

Measurement of the lateral position light bulb types were performed in alternating sessions by four operators. The same two operators were assigned to measure one bulb type each to minimize the possibility of any variation due to measurement procedures. Due to time constraints, the tail position light bulb type was measured by four different operators in groups of two, measuring in alternating sessions. One complete bulb profile (top and bottom) was measured in each session.

Results

Measured data

Intensity values were calculated from measured illuminance values by multiplying the IB-80 calibration factor (1×10^{-3}) by the distance squared between the objective lens of the photometer and the filament of the light bulb. Intensity profiles were plotted from the calculated data, and the FAA minimum intensity requirements were overlaid for comparison.

By specification, the intensity profiles for position light bulbs are to be symmetrical about a defined center point (center of the bulb filament as oriented for rotorcraft in the normal flying position). However, the masked dome configurations in this investigation were intended to modify the profiles. Therefore, top and bottom designations were assigned to the lateral light units depending on the orientation of the unit on the rotorcraft as dictated by the dome configuration (red or green). For the tail position lights, arbitrary top and bottom designations were assigned for the fixture since the units were symmetrical when oriented on the rotorcraft. A weld on the tail position light bulb arbitrarily was designated to indicate the top of the bulb. All light units were oriented as they would be on the rotorcraft.

Single sample data

Data in this section are presented by light unit type and represent only one sample measurement for each configuration (red, green, or clear; unmasked or masked; bright or dim). The same appropriate type bulb was measured in each configuration for each light fixture type. Intensity is plotted across the horizontal angular positions. Each vertical angular position is represented in a separate plot.

Figures D-1 to D-4 (Appendix D) represent intensity profiles for the OH-58D/UH-60 left (red) lateral position light for bright mode, unmasked, half-masked, and front-masked dome configurations; and dim mode, unmasked dome configuration. Table D-1 (Appendix D) presents measured illuminance and calculated intensity data for these lateral position light profiles in the order of configurations listed.

Figures E-1 to E-3 (Appendix E) represent intensity profiles for the OH-58D/UH-60 right (green) lateral position light for bright mode, unmasked and half-masked dome configurations; and dim mode, unmasked dome configuration. Table E-1 (Appendix E) presents measured illuminance and calculated intensity data for these lateral position light profiles in the order of configurations listed.

Figures F-1 and F-2 (Appendix F) represent intensity profiles for the UH-1/OH-58A or C/AH-1 left (red) lateral position light for bright mode, unmasked dome configuration; and dim mode, unmasked dome configuration. Table F-1 (Appendix F) presents measured illuminance and calculated intensity data for these lateral position light profiles in the order of configurations listed.

Figures G-1 and G-2 (Appendix G) represent intensity profiles for the UH-1/OH-58A or C/AH-1 right (green) lateral position light for bright mode, unmasked dome configuration; and dim mode, unmasked dome configuration. Table G-1 (Appendix G) presents measured illuminance and calculated intensity data for these lateral position light profiles in the order of configurations listed.

Figures H-1 to H-4 (Appendix H) represent intensity profiles for the OH-58A, C, or D/AH-1 tail position light for bright and dim mode, unmasked and masked configurations. Table H-1 (Appendix H) presents measured illuminance and calculated intensity data for these tail position light profiles in the order of configurations listed.

Figures I-1 to J-2 represent intensity profiles for the UH-1 and UH-60 tail position lights, respectively, for bright mode,

unmasked dome configuration; and dim mode, unmasked dome configuration. Tables I-1 and I-2 present measured illuminance and calculated intensity data for these tail position light profiles in the order of configurations listed.

Multiple sample data

Time constraints precluded a repeated measures analysis of light fixtures and masking designs. Sources of variation in intensity profiles include variability in lighting fixtures, bulbs, and masking technique (the actual application of the tape or paint). It is likely that variation between the physical characteristics of the light fixtures is minimal. And since applying the mask is a function of the performing individual, this variability would be difficult to assess. However, the variation between bulbs can be investigated.

Variability between intensity profiles of the same type bulbs can occur due to the physical characteristics of the bulbs (i.e., filaments, reflective coating, glass, etc.). Although bulbs are required to meet military specifications, manufacturer's quality control methods do not require inspection of all samples. To determine if any significant differences existed between bulb intensity profiles, multiple bulb sample measurements were made for the three bulb types. Data in this section are presented by bulb type and represent multiple sample measurements in one configuration each, per bulb type in an appropriate fixture type. Intensity is plotted across the horizontal angular positions. Each vertical angular position is represented in a separate plot.

Figure 8 presents intensity profiles for 14 samples of the Type II reflector lateral position light bulb measured in the OH-58D/UH-60 fixture in dim mode with an unmasked, red dome configuration. Table K-1 (Appendix K) presents measured illuminance and calculated intensity data for these 14 samples.

Figure 9 presents intensity profiles for 14 samples of the Type III reflector lateral position light bulb measured in the UH-1/OH-58A or C/AH-1 fixture in dim mode with an unmasked, red dome configuration. Table L-1 (Appendix L) presents measured illuminance and calculated intensity data for these 14 samples.

Figure 10 presents intensity profiles for 12 samples of the tail position light bulb measured in the OH-58A, C, or D/AH-1 fixture in dim mode with an unmasked dome configuration. Sample #10 was rejected prior to measurement because visual inspection revealed a significant flaw in the glass dome of the bulb. Table M-1 (Appendix M) presents measured illuminance and calculated intensity data for these 12 samples.

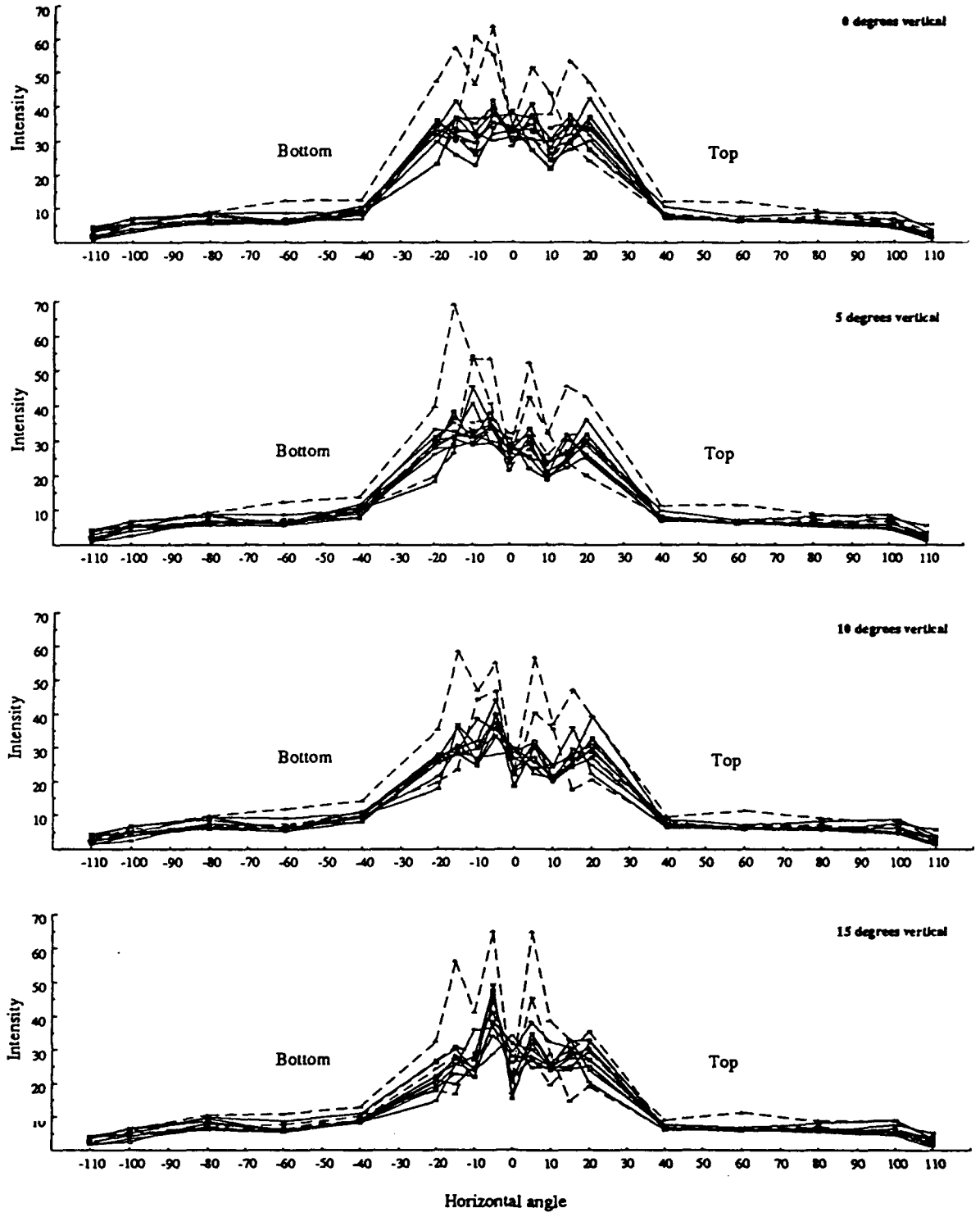

Figure 8a. Intensity profiles for type II lateral position light bulb (14 samples) in OH-58D/UH-60 fixture, red dome, unmasked in dim mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.
Note: bulbs #1, 2, 3, 8, and 9, represented by dashed lines, are eliminated in statistical analysis.

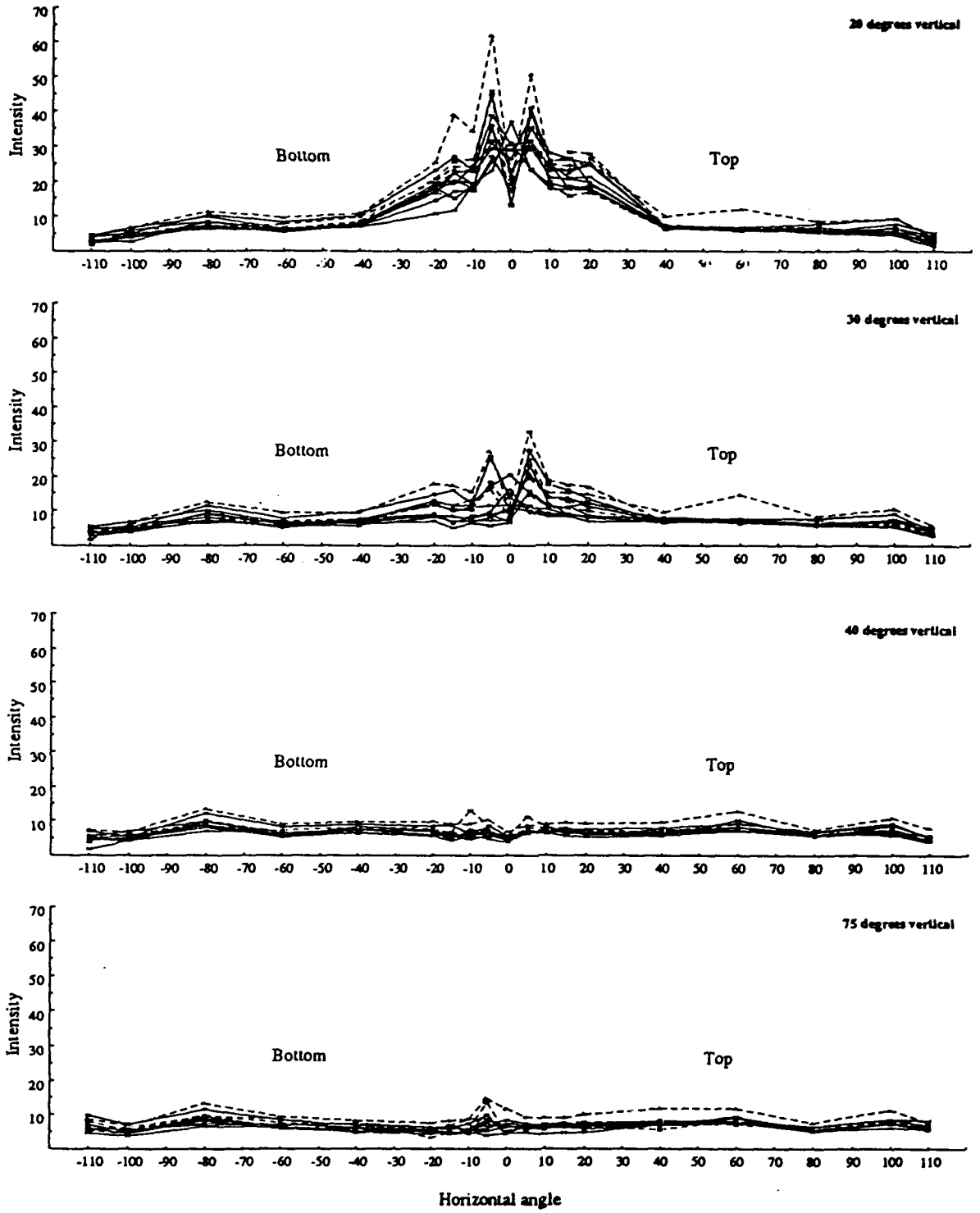

Figure 8b. Intensity profiles for type II lateral position light bulb (14 samples) in OH-58D/UH-60 fixture, red dome, unmasked in dim mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.
Note: bulbs #1, 2, 3, 8, and 9, represented by dashed lines, are eliminated in statistical analysis.

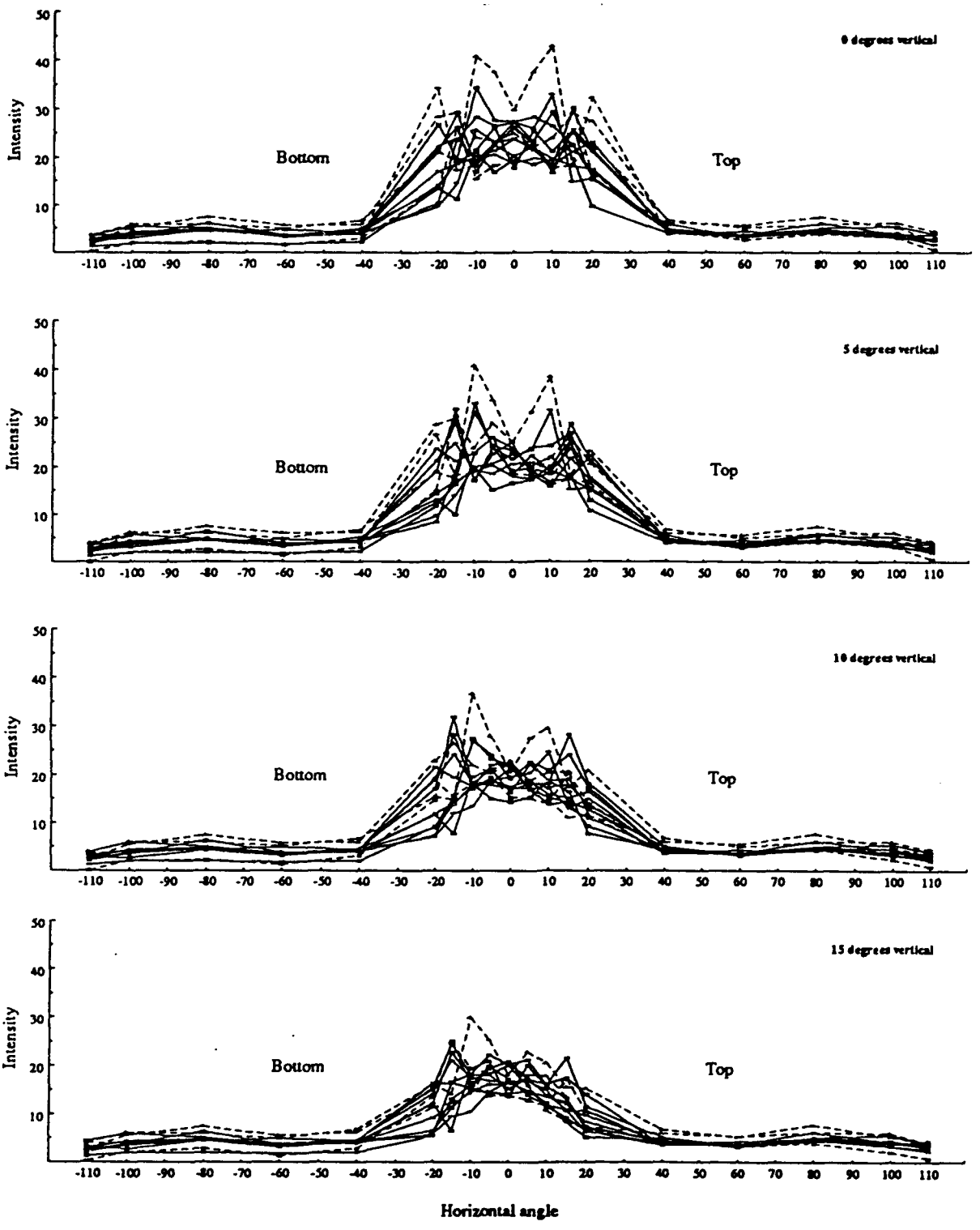

Figure 9a. Intensity profiles for type III lateral position light bulb (14 samples) in UH-1/OH-58A or C/AH-1 fixture, red dome, unmasked in dim mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.
Note: bulbs #1, 2, 7, and 8, represented by dashed lines, are eliminated in statistical analysis.

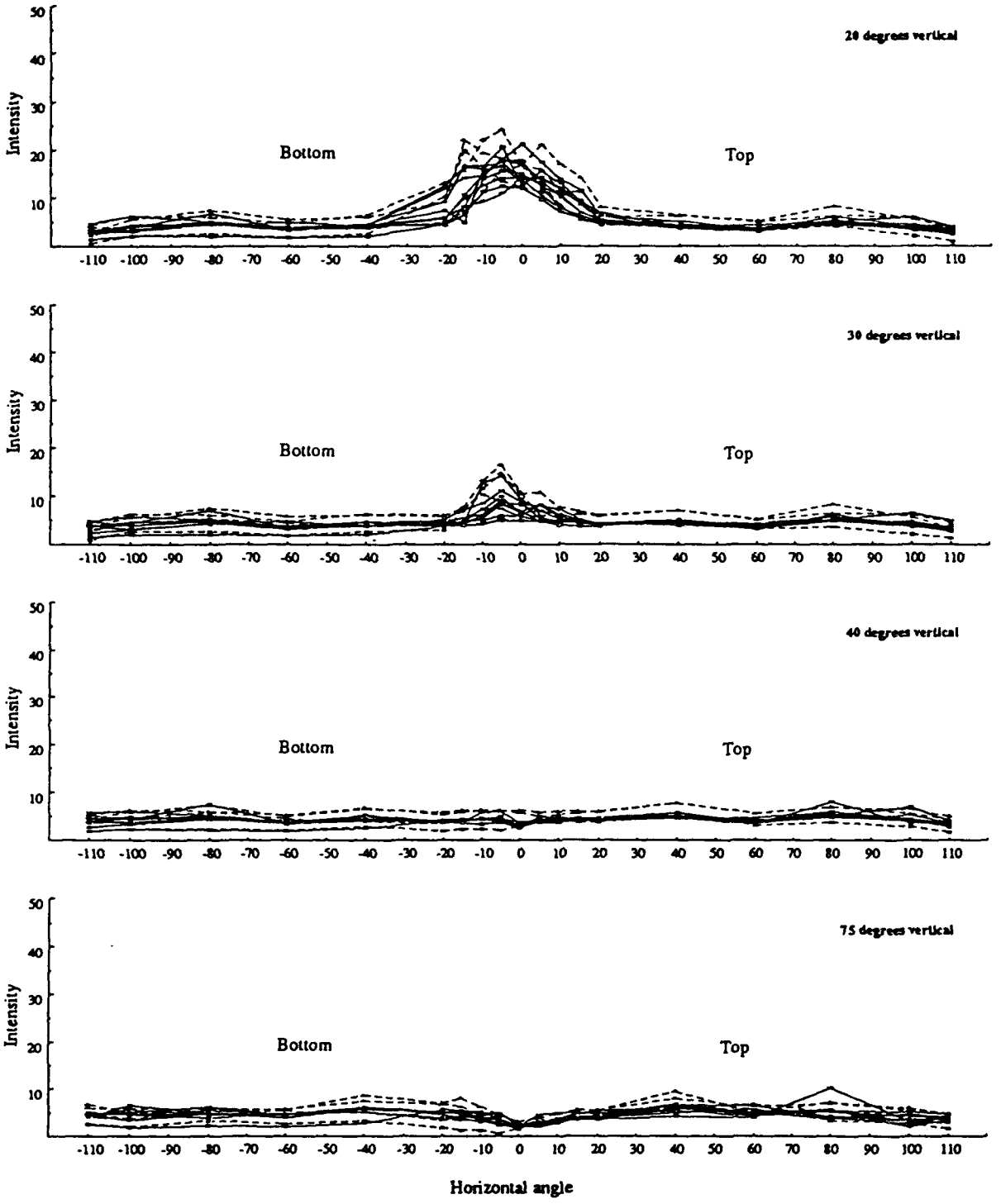

Figure 9b. Intensity profiles for type III lateral position light bulb (14 samples) in UH-1/OH-58A or C/AH-1 fixture, red dome, unmasked in dim mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.
Note: bulbs #1, 2, 7, and 8, represented by dashed lines, are eliminated in statistical analysis.

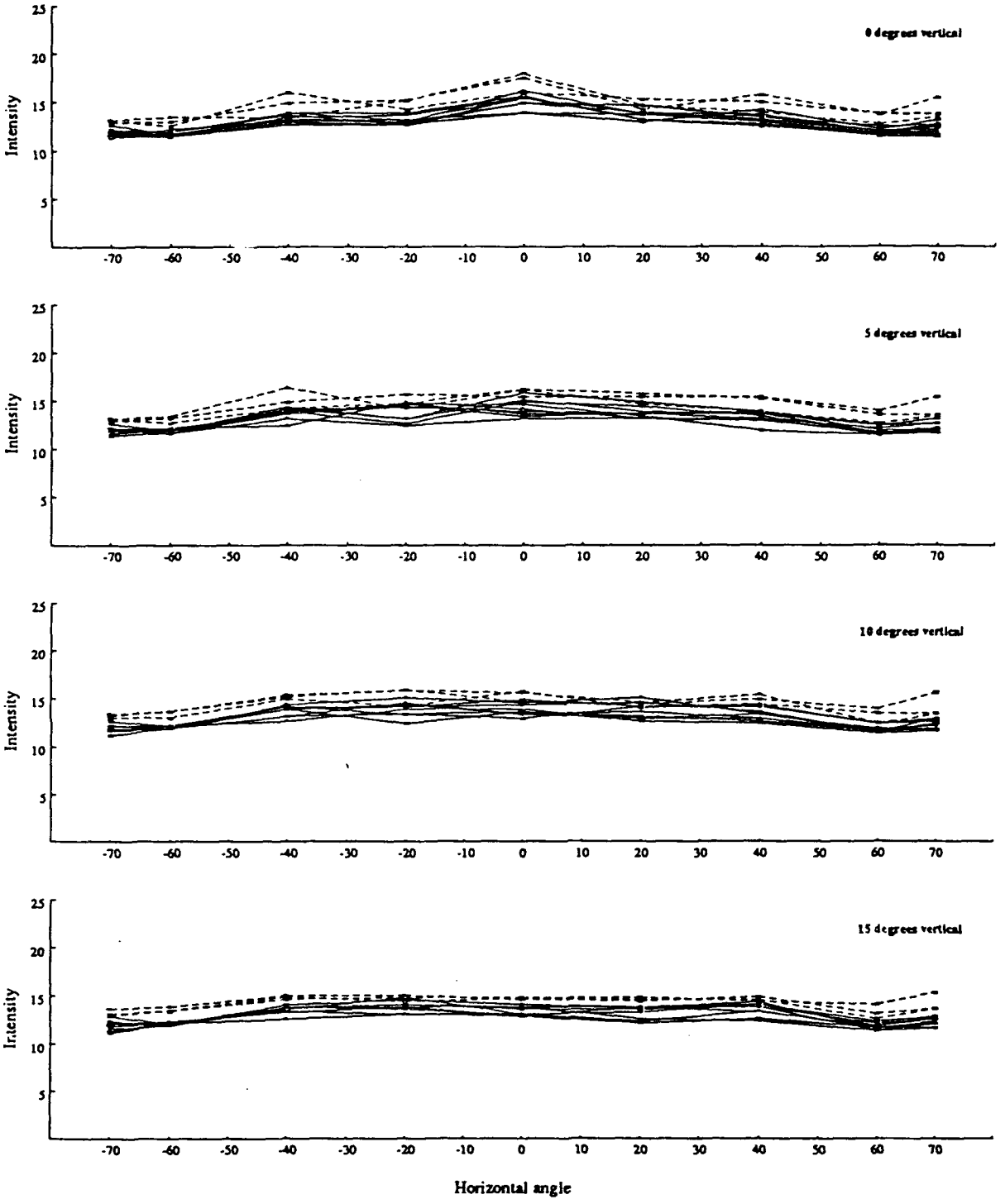

Figure 10a. Intensity profiles for tail position light bulb (12 samples) in OH-58A, C, or D/AH-1 fixture, unmasked in dim mode; top, vertical angles 0 to 15 degrees. Intensity expressed in candelas. Note: bulbs #1, 2, and 3, represented by dashed lines, are eliminated in statistical analysis.

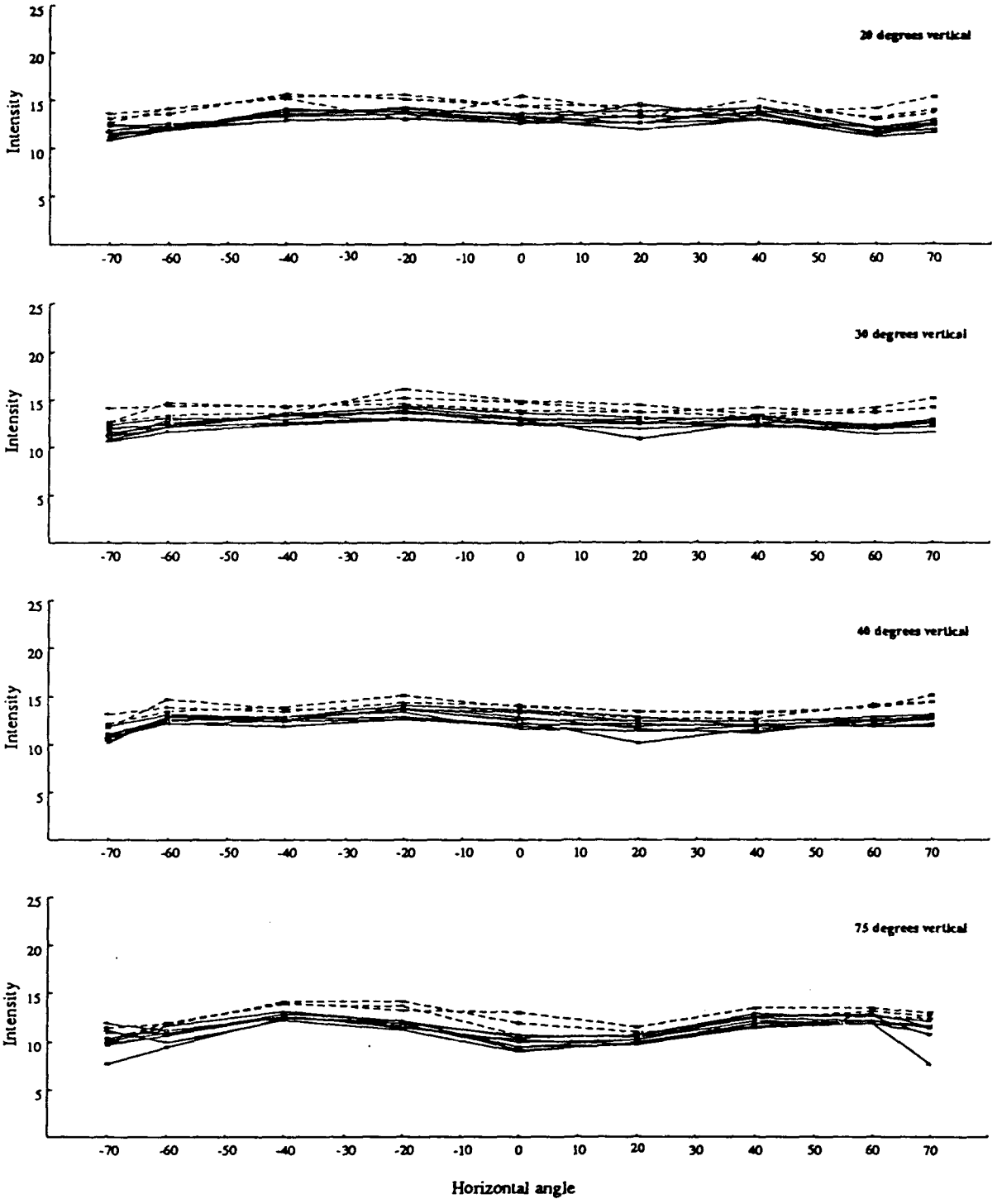

Figure 10b. Intensity profiles for tail position light bulb (12 samples) in OH-58A, C, or D/AH-1 fixture, unmasked in dim mode; top, vertical angles 20 to 75 degrees. Intensity expressed in candelas. Note: bulbs #1, 2, and 3, represented by dashed lines, are eliminated in statistical analysis.

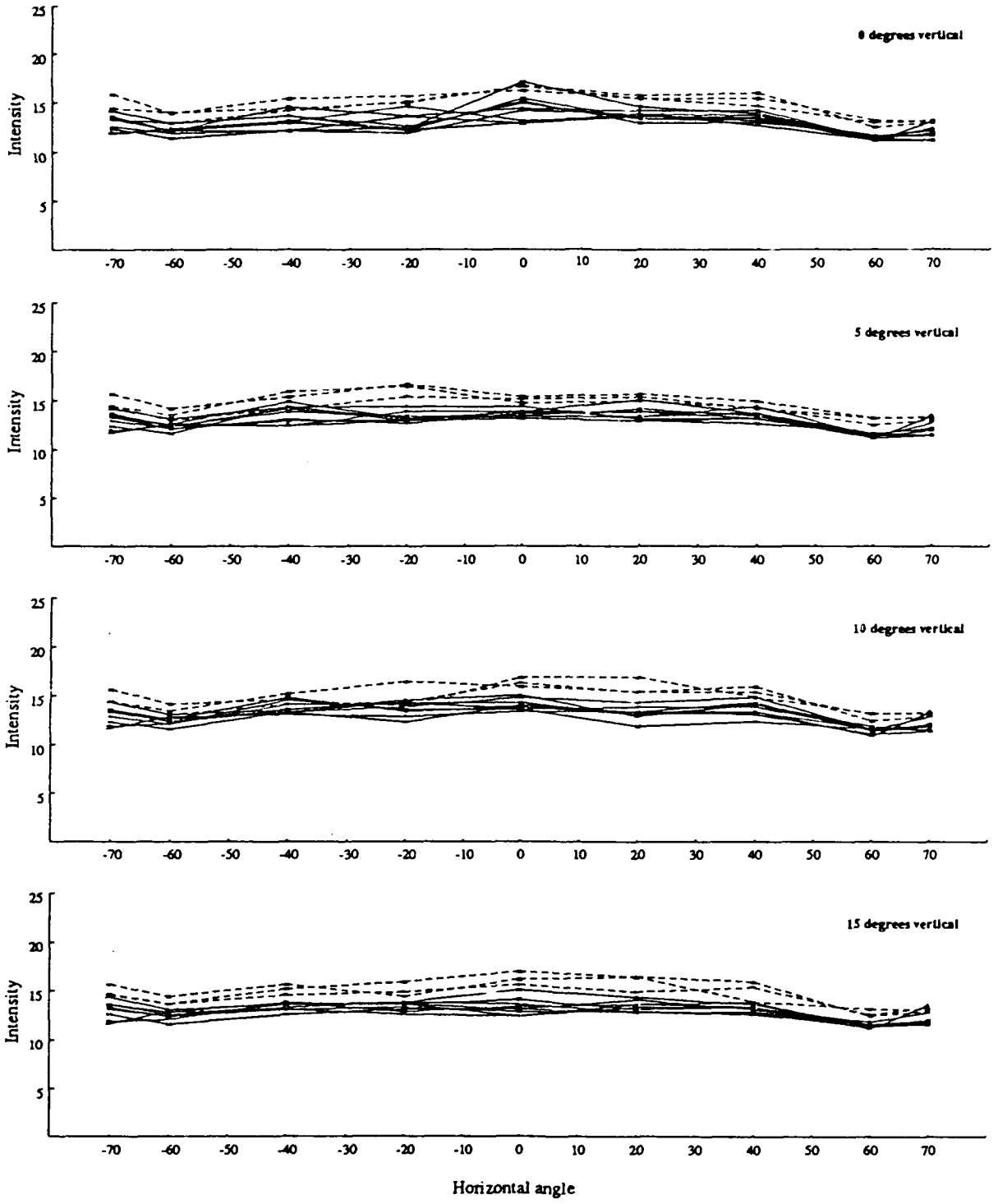

Figure 10c. Intensity profiles for tail position light bulb (12 samples) in OH-58A, C, or D/AH-1 fixture, unmasked in dim mode; bottom, vertical angles 0 to 15 degrees. Intensity expressed in candelas. Note: bulbs #1, 2, and 3, represented by dashed lines, are eliminated in statistical analysis.

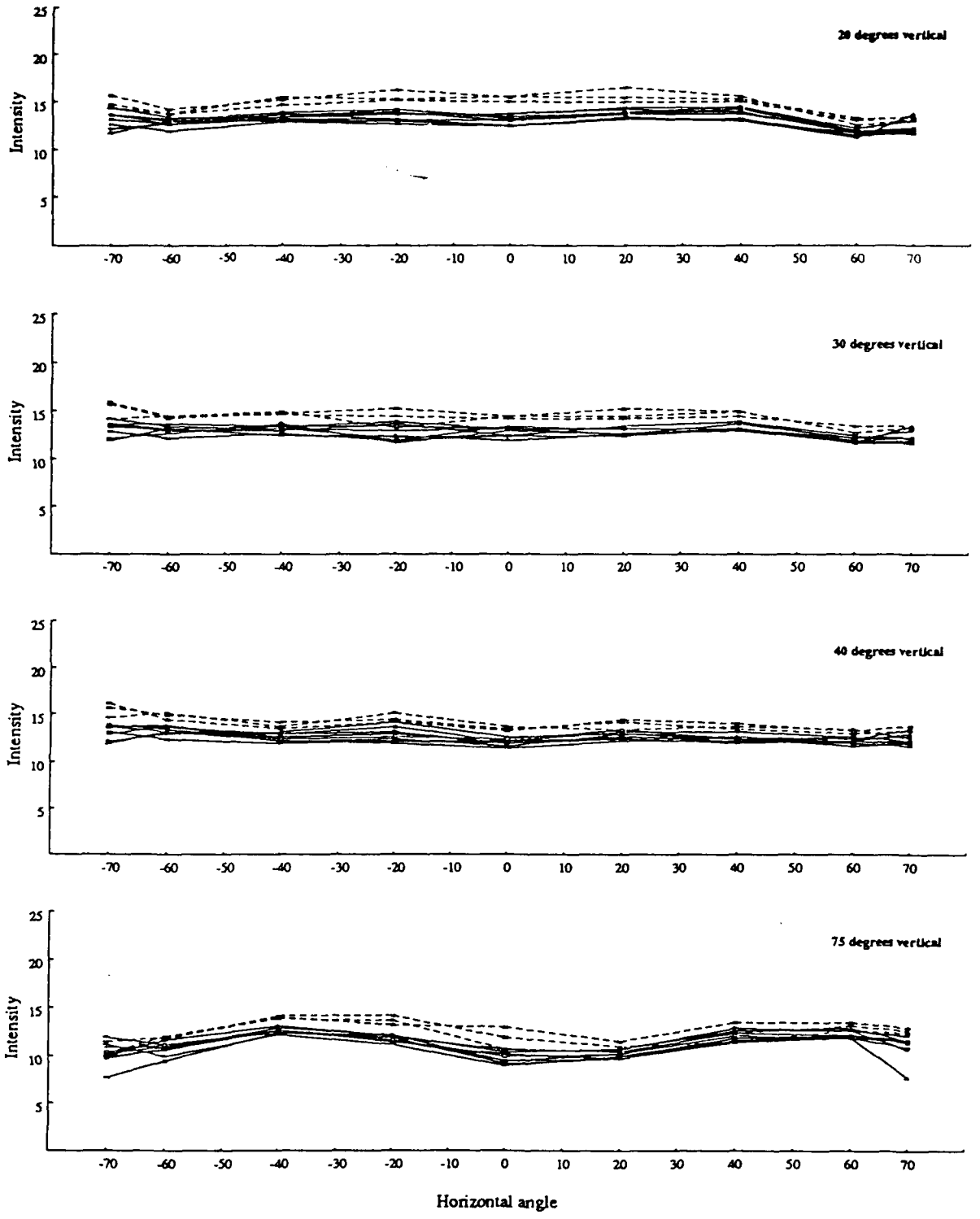

Figure 10d. Intensity profiles for tail position light bulb (12 samples) in OH-58A, C, or D/AH-1 fixture, unmasked in dim mode; bottom, vertical angles 20 to 75 degrees. Intensity expressed in candelas. Note: bulbs #1, 2, and 3, represented by dashed lines, are eliminated in statistical analysis.

Bulb variability analysis

An analysis of variance (ANOVA) was performed on the calculated intensity values to determine if any significant variation existed among bulbs of the same type. The goal of the analysis of variance is to determine whether variation among bulb sample means is significantly different than variation within bulb sample means. If the among sample means variation is greater than within sample means variation, it is concluded that at least one sample is significantly different from all other samples of the same bulb type. For this analysis, bulb intensity data are grouped by angular positions where similar intensity requirements are specified by the FAA. Within each of the groups, for each bulb sample type, it is assumed that intensity values are normally distributed and variances are the same.

As shown in Figure 5 and Table 3, the FAA specifies different intensity requirements at locations around the position lights in the horizontal and vertical planes. Therefore for this analysis, intensity data are grouped by positions where similar intensities are required. For the lateral position lights, the data are broken down into three groups in the horizontal angular direction. Table K-1 (Appendix K) shows that the first horizontal group consists of data points in the positions between 0 to ±10 degrees horizontal (values in dotted line box); the second group consists of data points in the positions between +15 to +20 and -15 to -20 (±15 to ±20) degrees horizontal (values in double line box); the third group consists of data points in the positions between +40 to +110 and -40 to -110 (±40 to ±110) degrees horizontal (values in dashed line box). Data are grouped further by vertical angular position at 0, ±5, ±10, ±15, ±20, ±30, ±40, and ±75 degrees vertical. For the tail position lights, all positions in the horizontal angular direction are grouped together between 0 to ±70 degrees (Table M-1) since the intensity requirement is the same across the horizontal direction. Data also are grouped by vertical angular position.

The first two samples of each bulb type are eliminated from the analysis of variance because these measurements were considered practice runs. Any other samples where variation is suspected to be attributed to causes other than the bulb effects also are eliminated.

Figure 8 shows the intensity profiles for all samples measured of the type II lateral position light bulb. Samples #1, 2, 3, 8, and 9 (represented by dashed lines in the figure) are eliminated from this analysis. In the measurement of sample #3, the photometer was discovered to be out of alignment with the light unit; for bulbs #8 and 9, the power to the light unit was

inadvertently increased so that the resulting profiles are shifted up in intensity as can be seen in the plots. The analysis of variance for the nine remaining bulb samples indicates that at least one bulb sample is significantly different (0.01 confidence level) at the positions between ±15 to ±20 degrees horizontal and ±40 degrees vertical.

Figure 9 shows the intensity profiles for all samples measured of the type III lateral position light bulb. Samples #1, 2, 7, and 8 (represented by dashed lines in the figure) are eliminated in this analysis. In the measurement of samples #7 and 8, the power to the light unit was inadvertently increased so that the resulting profiles are shifted up in intensity as shown in the plots. The analysis of variance for the 10 remaining bulb samples indicates numerous positions where at least 1 bulb sample is significantly different at a 0.05 confidence level. Statistically significant differences exist at positions between 0 to ±10 degrees horizontal and 0, ±5, and ±20 degrees vertical; between ±15 to ±20 degrees horizontal and 0, ±5, ±10, ±40, and ±75 degrees vertical; and between ±40 to ±110 degrees horizontal and ±10, ±15, ±20, ±30, ±40, and ±75 degrees vertical.

Figure 10 shows the intensity profiles for all samples measured of the tail position light bulb type. Samples #1, 2, and 3 (represented by dashed lines in the figure) are eliminated in this analysis. Sample #10 was rejected prior to measurement due to a large area of distortion on the bulb surface. Following the measurement of sample #3, the dimming resistor failed. A second resistor, with a 1.5 VDC difference in resulting voltage drop, was used in subsequent measurements of the tail position light bulb type. Figure 10 shows that intensity profiles for bulbs #1, 2, and 3 are slightly higher than for other bulbs, especially for the bottom half of the bulbs. The analysis of variance for the nine remaining bulb samples indicate that for positions between ±70 degrees horizontal and ±30 degrees vertical, at least one bulb sample is significantly different at the 0.05 confidence level.

Discussion

Position light configurations

Figures D-1 to D-4 (Appendix D) show single sample intensity profiles for the OH-58D/UH-60 lateral position light in the left side (red) configuration. Figure D-1 depicts the profile for this light, with an unmasked dome in bright mode. In this configuration, intensity values exceed minimum requirements except at ±110 degrees horizontal where intensities are marginal when standard deviations at these positions are considered. Figure D-2 depicts the profile for the half-masked, red dome

configuration in bright mode. This profile shows that at the masked positions for this light, minimum intensity requirements are not met. Also, in comparison to the bright mode, unmasked configuration, the intensities in this half-masked profile generally are lower due to absorption of light by the black paint masking on the inside surface of the dome. This decrease in visible light energy causes intensity to be only marginally passable beyond 60 degrees horizontal in the unmasked portion of this light. Figure D-3 depicts the profile for this light in a front-masked, red dome configuration in bright mode. Again, the intensities at the masked positions for this configuration do not meet minimum requirements. However, at the unmasked positions, the intensities comply with minimum requirements. Figure D-4 shows that for this light in an unmasked, red dome configuration in dim mode, intensities in the critical region (within 0 to ±20 degrees horizontal and vertical) are marginally passable to failing.

Figures E-1 to E-3 show single sample intensity profiles for the OH-58D/UH-60 lateral position light in the right side (green) configuration. The intensity profiles for this light in the green configuration are similar to corresponding profiles in the red configuration. The same bulb and light fixtures were used for both red and green dome configurations. Figures E-1 and E-2 depict profiles for this green light in bright mode with the unmasked and half-masked domes, respectively. As with the red light, intensities in the unmasked portions of the light meet or exceed the FAA requirements. The half-masked domes (red and green) are hand painted so that the profiles in Figures D-2 and E-2 are somewhat dissimilar. Differences occur around the edge of the paint masking and are most prevalent in the critical region. Figure E-3 shows that, as with the unmasked, dim mode configuration for the red light, intensities for this green light in dim mode do not meet FAA minimum requirements inside the critical region. Outside this region, the intensities are marginally passable.

Figures F-1 and F-2 show single sample intensity profiles for the UH-1/OH-58A or C/AH-1 lateral position light in the left side (red) configuration. Figure F-1 shows that, in bright mode with an unmasked dome, the intensities for this configuration fail the minimum requirements in the critical region between 0 to ±20 degrees horizontal for all vertical angular positions. In the noncritical regions, the intensity profiles are passable to marginally passable. The profiles for this light configuration in dim mode are similar in shape with lower intensity values. As shown in Figure F-2, intensities do not meet minimum requirements in the critical regions and are only marginally passable in the noncritical regions.

Figures G-1 and G-2 show single sample intensity profiles for the UH-1/OH-58A or C/AH-1 lateral position light in the

right side (green) configuration. Figure G-1 shows that this configuration, in bright mode with an unmasked dome, is marginally passable in the horizontal critical region (0 to ±20 degrees), with the exception of positions 0 to -20 degrees horizontal at +10 to +20 degrees vertical, top. In the horizontal noncritical regions (±30 to ±110 degrees), the intensities meet or exceed FAA minimum requirements. Overall, the bright mode intensities for this green dome configuration are higher than for the red dome configuration. Figure G-2 shows that in dim mode, the intensities in the horizontal critical region fail minimum requirements through all vertical angles. In the horizontal noncritical regions, the intensities are failing to marginally passable.

Figures H-1 to H-4 show single sample intensity profiles for the OH-58A, C, or D/AH-1 tail position light for unmasked and masked clear dome configurations. Figure H-1 depicts the profile for the light as unmasked and in bright mode. All FAA minimum intensity requirements are met in this configuration. As shown in Figure H-2, when masked with tape in the configuration shown in Figure 1c, intensities are generally below 3 candelas except at positions not covered by tape (at 0 horizontal between 10 to 30 degrees vertical, bottom). Minimum intensity requirements are met only between 15 to 30 degrees vertical (bottom) within the horizontal critical region due to the small size of the unmasked region of the light. Intensities in the unmasked regions of this light are approximately 10 candelas lower than at corresponding positions in the unmasked configuration due to absorption of light by the masking tape. As heat built up and was absorbed, the tape masking began to melt and contract around the edges. The leaking of light is revealed by intensity spikes at the extreme horizontal and vertical angular position. Figure H-3 shows that in dim mode with an unmasked dome, the intensities for this light are failing to marginal across all horizontal angles for 0 to ±15 degrees in the vertical direction. Figure H-4 depicts the profiles for this light in dim mode with a masked dome. In the masked region of this configuration, the intensities are generally below 1 candela. In the unmasked region, at the bottom half of the light, intensity is only marginally passable at 0 horizontal between 20 and 30 degrees vertical.

Figures I-1 and I-2 show single sample intensity profiles for the UH-1 tail position light for the clear dome configuration. Figure I-1 depicts the profile for the light unmasked and in bright mode, and Figure I-2 depicts the same configuration in dim mode. These profiles are similar in shape and intensity to corresponding profiles for the OH-58A, C, or D/AH-1 tail position light. The bright mode intensities meet or exceed requirements. The dim mode intensities are failing to marginal in the vertical critical region between 0 and ±15 degrees vertical.

Figures J-1 and J-2 show single sample intensity profiles for the UH-60 tail position light for the clear dome configuration. Figure I-5 depicts the profile for the light unmasked and in bright mode, and Figure I-6 depicts the same configuration in dim mode. These profiles are similar in shape and intensity to corresponding profiles for the OH-58A, C, or D/AH-1 and UH-1 tail position lights, with the exception of horizontal positions ±60 and ±70 degrees. The intensities decrease at these positions due to a physical obstruction in the light fixture design which can be seen in Figure 3. The bright mode intensities meet or exceed requirements. The dim mode intensities are failing to marginal in the vertical critical region between 0 and ±15 degrees vertical.

These measured intensity profiles show that masking of the position light domes diminishes emitted intensity of light by absorbing or obstructing light energy. Paint or tape is used to mask the position light domes. Paint obstructs and absorbs light energy as evidenced by the lower intensity values for the half-masked dome profiles versus the unmasked dome profiles in red and green configurations (Figures D-1 and D-2, E-1 and E-2; Tables D-1 and E-1). Green "100-mile an hour" duct tape obstructed almost all light from being emitted in masked regions as shown by the minimal intensity values of the OH-58A, C, or D/AH-1 tail light profiles (Figures H-2 and H-4 and Table H-1). Measurements of masked configurations, in bright mode, shows that any masking (paint or tape) modified emitted light intensity in the obstructed areas so that FAA requirements are not achieved. Masked dome configurations were also operated in dim mode. The masked, dim mode configuration was not evaluated for all masking schemes. Based on masked and dim mode configurations data collected, position lights in this configuration will not meet FAA requirements.

Single sample bright mode and masked configuration profiles for the different position light types can be evaluated by extrapolating appropriate standard deviation values from the multiple bulb sample analysis of variance. For each bulb type, Table 7 lists the standard deviations and coefficients of variation determined in the multiple bulb sample analysis of variance. The coefficient of variation (CV) values allow comparison of variation of intensity values by angular position.

Bulb variability

The analysis of variance performed on the multiple sample bulb data demonstrates that, in general, the intensity distributions among the samples measured of the type II lateral position light bulb and the tail position light bulb are not

Table 7.

Position light bulb types analysis of variance statistics summary.

Position (horiz, vert)	Standard deviation (candelas)	Coefficient of variation %
Type II -- OH-58D/UH-60 lateral position light		
(0-10,0)	5.51	17.20
(0-10,5)	5.96	21.06
(0-10,10)	6.25	22.52
(0-10,15)	7.59	26.22
(0-10,20)	7.96	30.72
(0-10,30)	5.40	46.11
(0-10,40)	1.12	18.97
(0-10,75)	1.66	26.59
(15-20,0)	4.05	12.33
(15-20,5)	4.03	13.94
(15-20,10)	4.28	15.15
(15-20,15)	4.50	17.64
(15-20,20)	3.70	19.06
(15-20,30)	2.67	27.73
(15-20,40)	0.87	13.65
(15-20,75)	1.00	16.79
(40-110,0)	2.22	37.69
(40-110,5)	2.26	38.23
(40-110,10)	2.19	37.08
(40-110,15)	2.02	34.60
(40-110,20)	1.83	31.48
(40-110,30)	1.75	28.57
(40-110,40)	1.72	26.47
(40-110,75)	1.44	21.53

Position (horiz, vert)	Standard deviation (candelas)	Coefficient of variation %
Type III -- UH-1/OH-58AC/AH-1 lateral position light		
(0-10,0)	4.14	18.19
(0-10,5)	4.06	19.14
(0-10,10)	3.42	18.11
(0-10,15)	2.88	17.40
(0-10,20)	3.36	24.03
(0-10,30)	2.62	38.33
(0-10,40)	0.95	24.74
(0-10,75)	1.16	39.01
(15-20,0)	5.20	26.82
(15-20,5)	5.70	30.83
(15-20,10)	5.87	37.62
(15-20,15)	4.95	42.31
(15-20,20)	3.21	41.73
(15-20,30)	0.64	14.17
(15-20,40)	0.30	7.14
(15-20,75)	0.69	15.42
(40-110,0)	1.00	26.14
(40-110,5)	0.99	25.95
(40-110,10)	0.99	25.88
(40-110,15)	0.98	25.44
(40-110,20)	0.97	24.85
(40-110,30)	0.98	24.10
(40-110,40)	1.05	24.53
(40-110,75)	1.23	26.62

Position (horiz, vert)	Standard deviation (candelas)	Coefficient of variation %
OH-58ACD/AH-1/UH-1/UH-60 tail position light		
(+70-70,0)	1.12	8.74
(+70-70,5)	1.03	7.93
(+70-70,10)	1.03	7.93
(+70-70,15)	0.88	6.85
(+70-70,20)	0.84	6.55
(+70-70,30)	0.70	5.54
(+70-70,40)	0.75	6.02
(+70-70,75)	1.32	11.84

significantly different. This fact established, these two bulb types (in dim mode with a red dome filter for the lateral light or clear dome filter for the tail light) can be represented by a mean intensity profile where an average value for each position is calculated from bulb sample data included in the analysis. The mean intensity profiles for these two bulb types are shown in Figures 11 and 12, respectively, with error bars representing one standard deviation at each position. The analysis of variance for the 14 samples of the Type III lateral position light bulb type indicates that significant variation does occur among bulbs of this type. Although variation is known to exist (e.g., filament and reflector differences), the bulb type intensity profile (in dim mode with a red dome filter) can be represented by the average value of the measured samples when variability around each position is considered. Figure 13 shows the mean intensity profile for the type III position light bulb type with error bars which represent one standard deviation at each position.

Variation in measured intensity can be attributed to numerous causes such as photometer/sample alignment, photometer calibration drift, or measurement differences due to operators. Bulb attributes such as filament orientation (i.e., alignment or canting), bulb surface shape, reflective coating application, or stray light from reflections also can contribute to variations in measured intensity. Figures 14 and 15 show multiple reflections on the back surfaces of type II and type III lateral position light bulbs, respectively. The position of the bulb in Figure 14a is (0,0), Figure 14b is (10,20), Figure 15a is (0,0), and Figure 15b is (5,5). Each reflection contributes additional light energy which results in higher photometer illuminance readings. As the photos show, the multiple reflections occurred at varied locations and to different extents based on the shape of the bulb surface. Spikes appeared in the intensity profiles at positions where reflections occurred (Figures 8 and 9). The tail light bulb type was not reflectorized so that filament orientation did not have critical impact upon intensity. This can be seen in the relatively flat profiles in Figure 10.

I^2 compatibility

User data presented in Table 1 indicate that the red and clear filtered lights on the exterior of the aircraft cause problems in operations with image intensifiers, while the green filtered lights do not. This phenomenon is attributable to the average luminous transmittance and spectral emittance of the filters and the spectral sensitivity of the I^2 tubes. Second generation I^2 tubes are responsive to light emitted between the wavelengths 380 nanometers (nm) to 850 nm, and third generation I^2 tubes are responsive to light emitted between the wavelengths 450 nm to 950 nm.

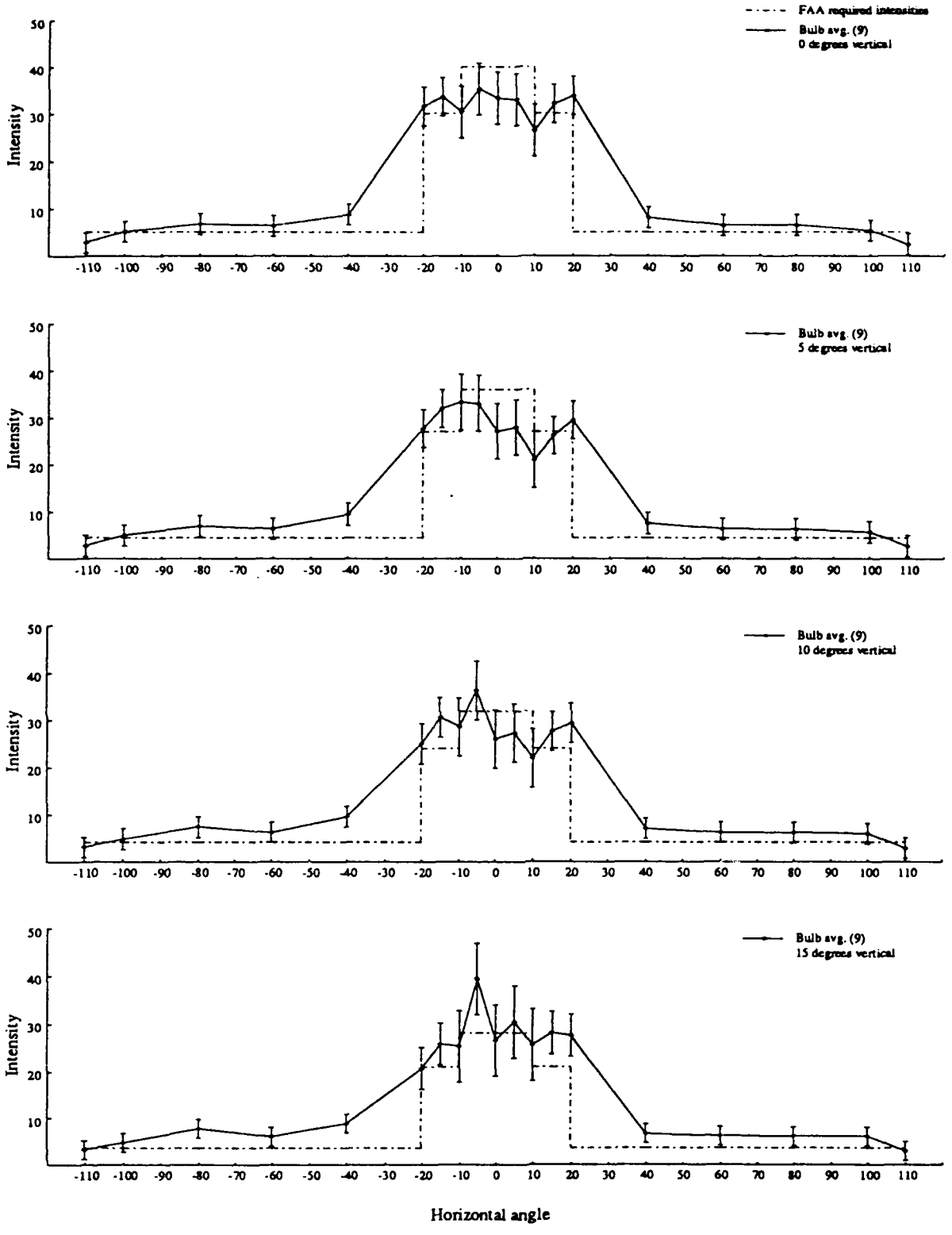

Figure 11a. Mean intensity profiles for type II lateral position light bulb (9 samples) with one standard deviation error bars at each measured position; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

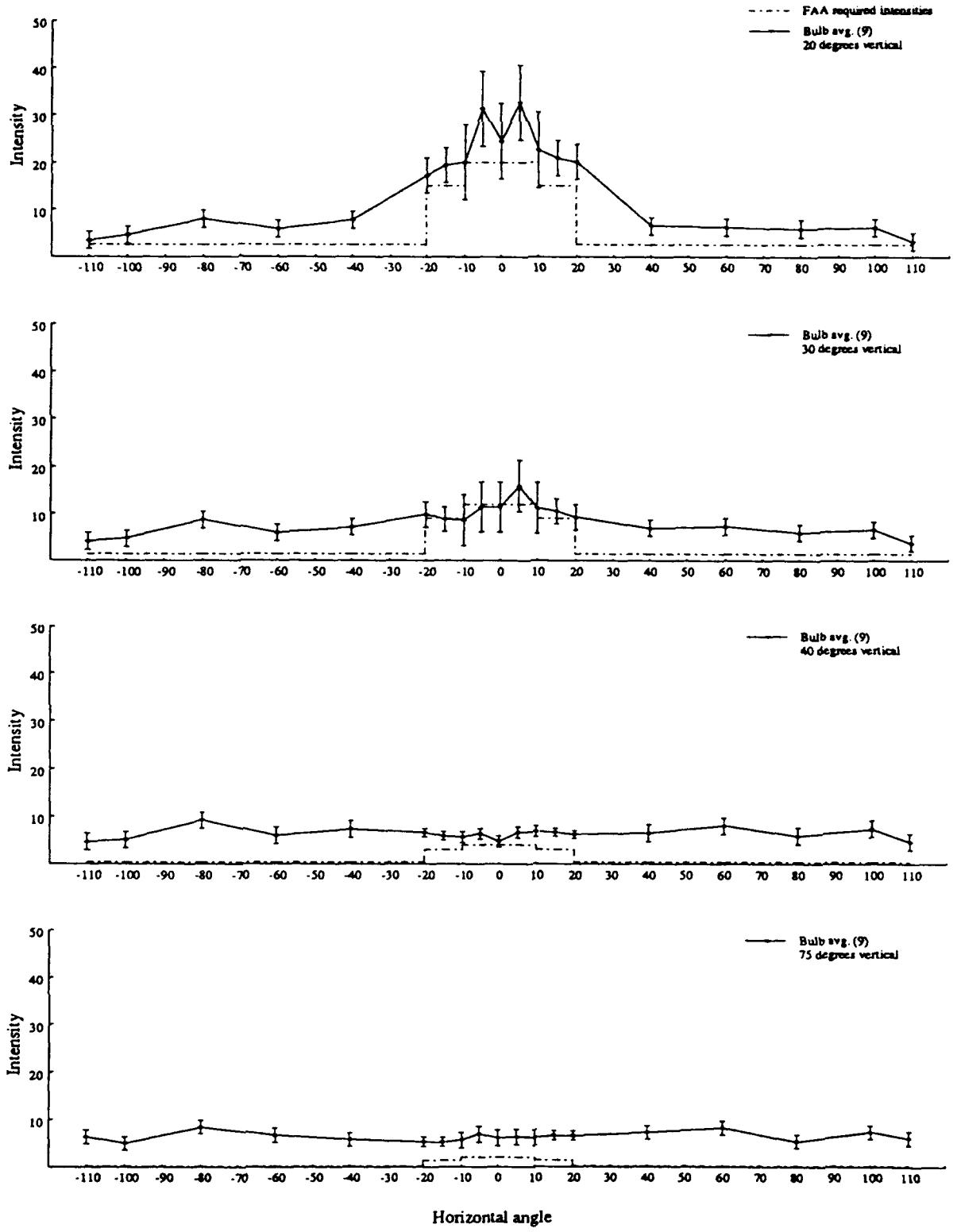

Figure 11b. Mean intensity profiles for type II lateral position light bulb (9 samples) with one standard deviation error bars at each measured position; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

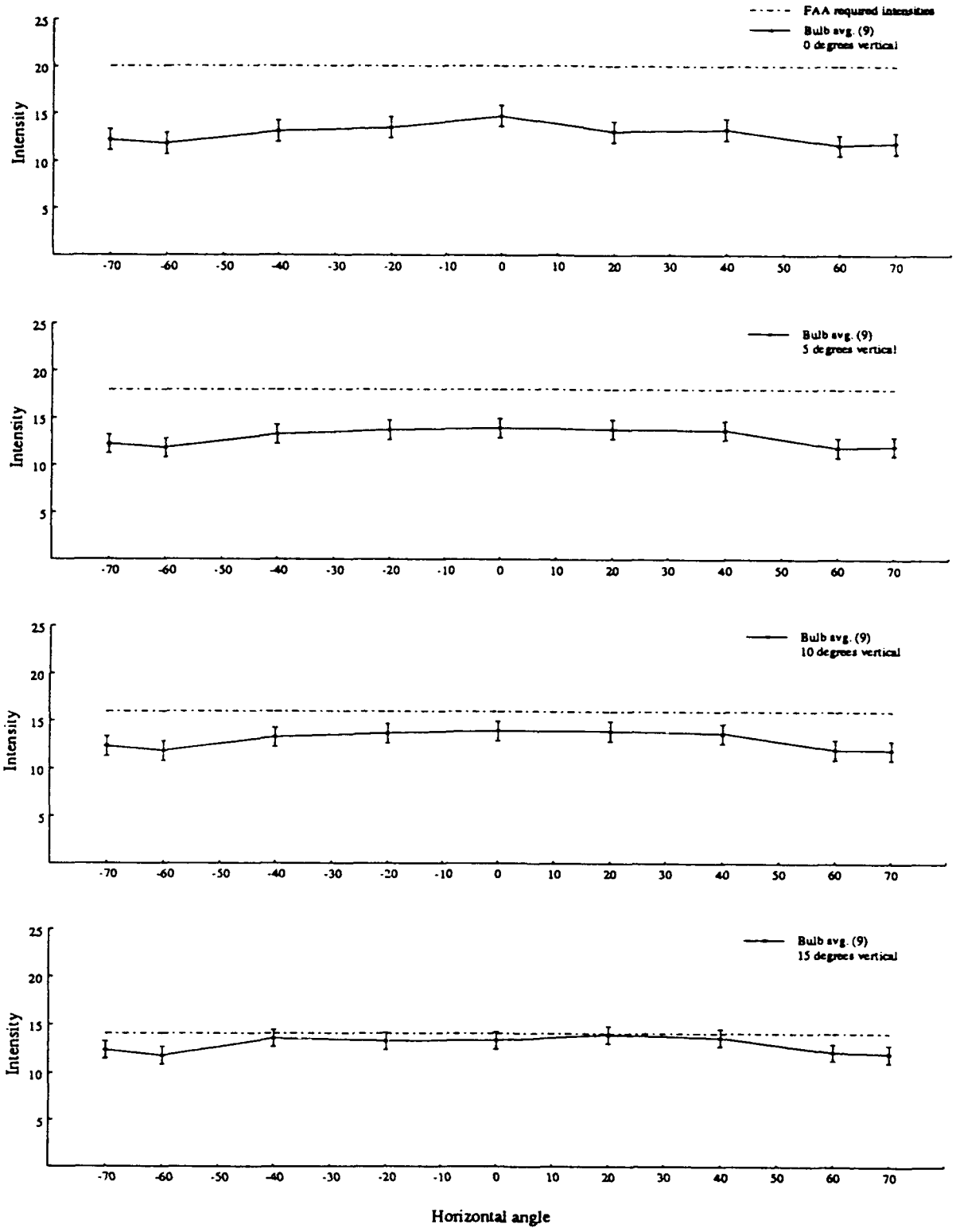

Figure 12a. Mean intensity profiles for tail position light bulb (9 samples) with one standard deviation error bars at each measured position; top, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

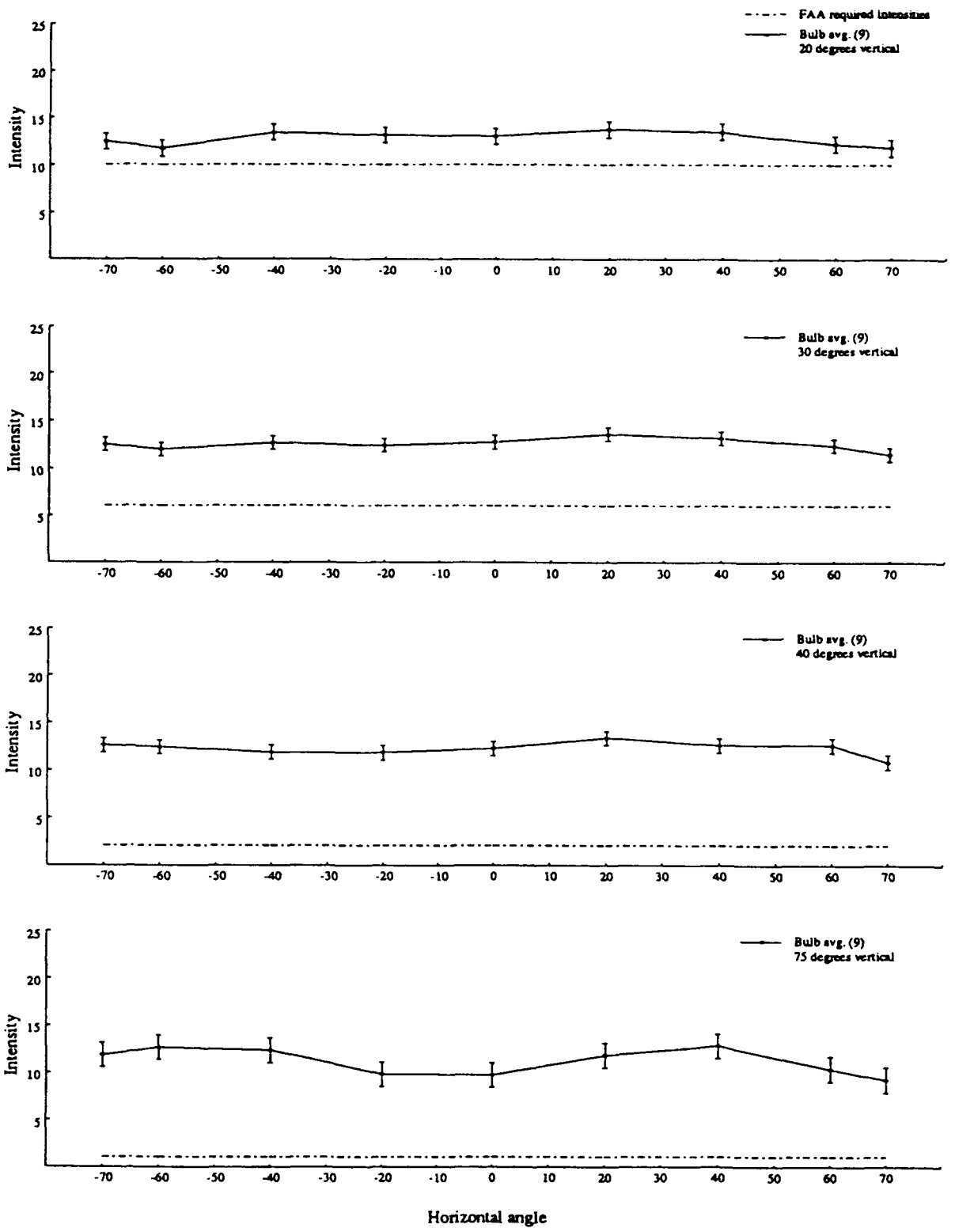

Figure 12b. Mean intensity profiles for tail position light bulb (9 samples) with one standard deviation error bars at each measured position; top, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

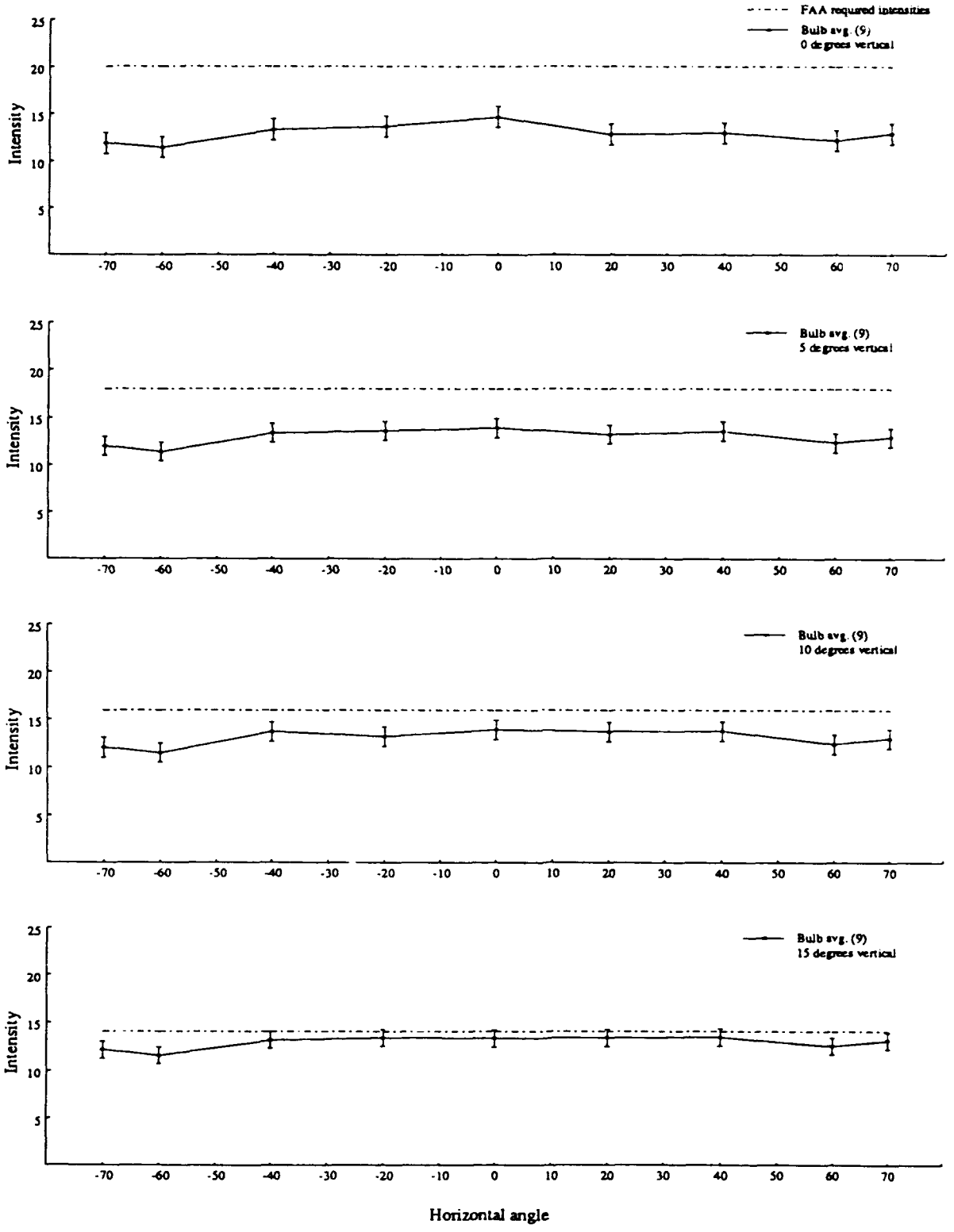

Figure 12c. Mean intensity profiles for tail position light bulb (9 samples) with one standard deviation error bars at each measured position; bottom, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

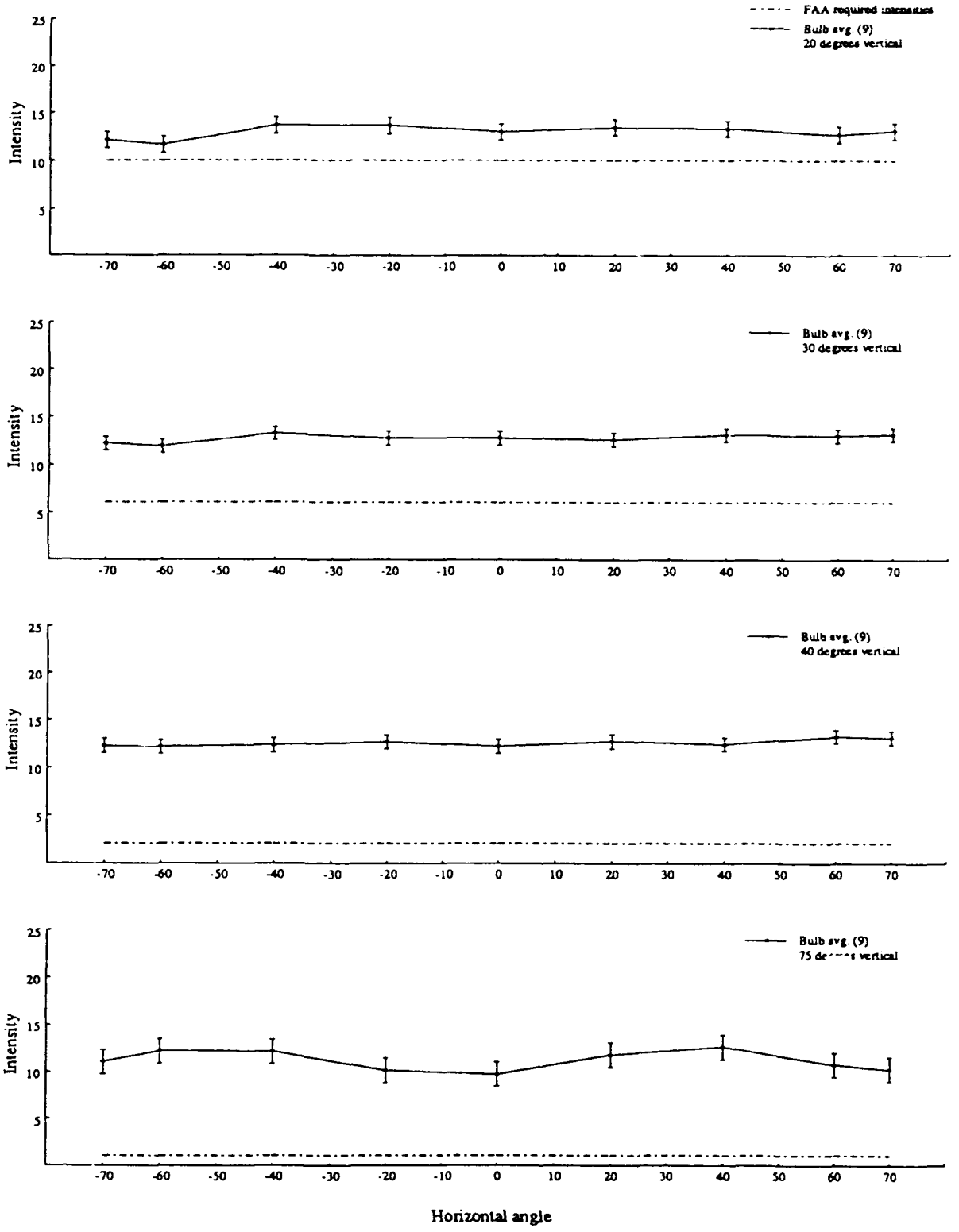

Figure 12d. Mean intensity profiles for tail position light bulb (9 samples) with one standard deviation error bars at each measured position; bottom, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

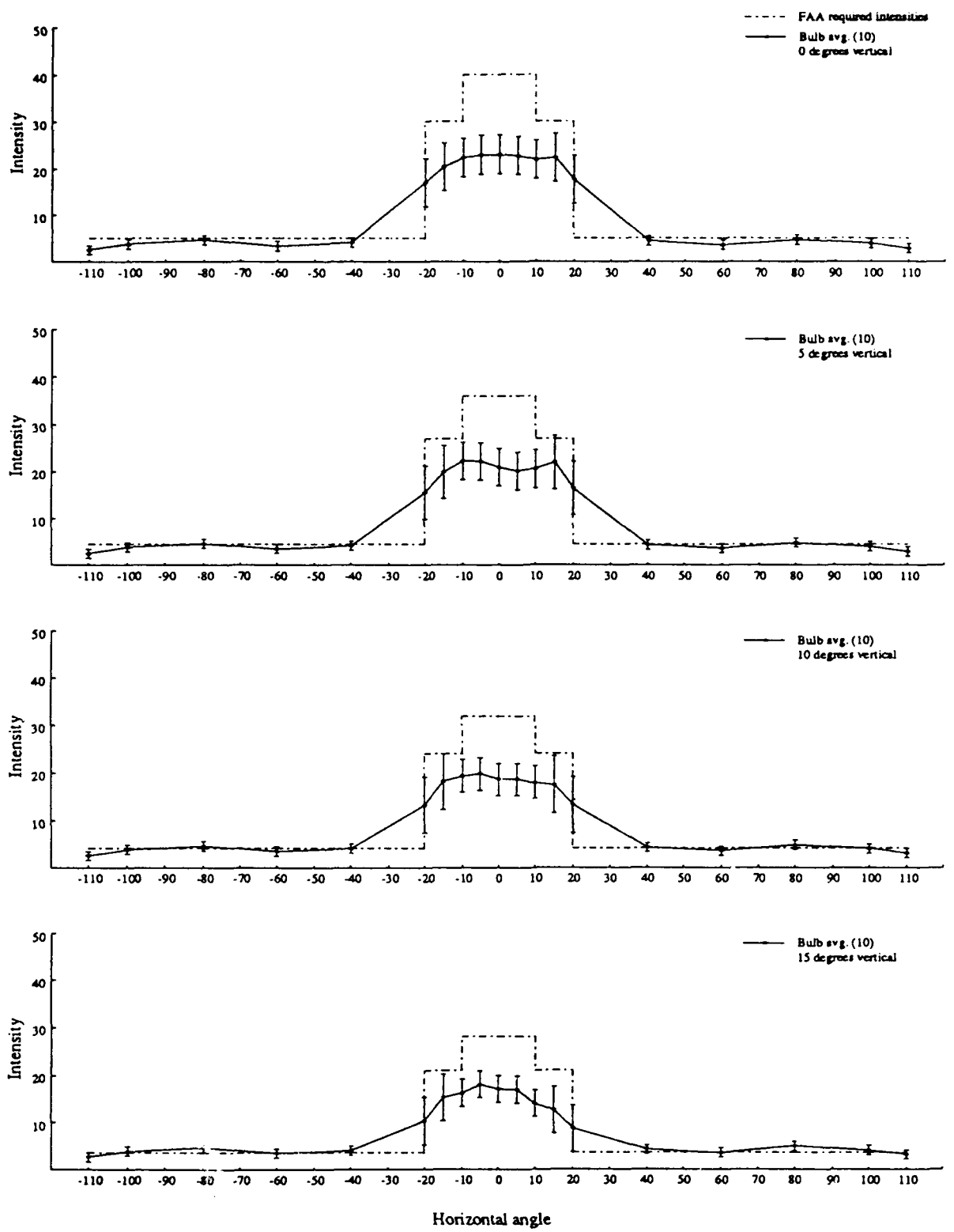

Figure 13a. Mean intensity profiles for type III lateral position light bulb (10 samples) with one standard deviation error bars at each measured position; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

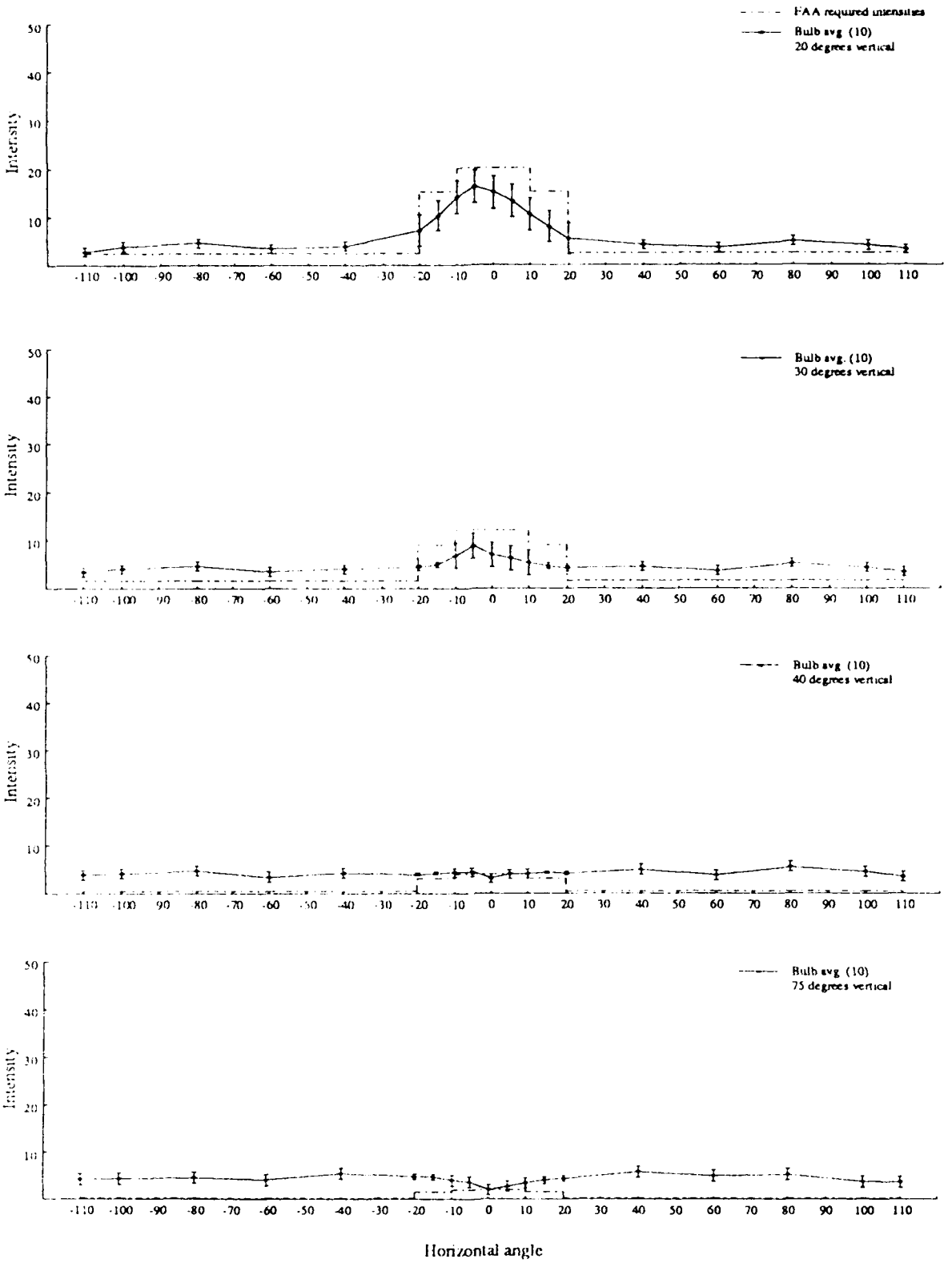

Figure 13b. Mean intensity profiles for type III lateral position light bulb (10 samples) with one standard deviation error bars at each measured position; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

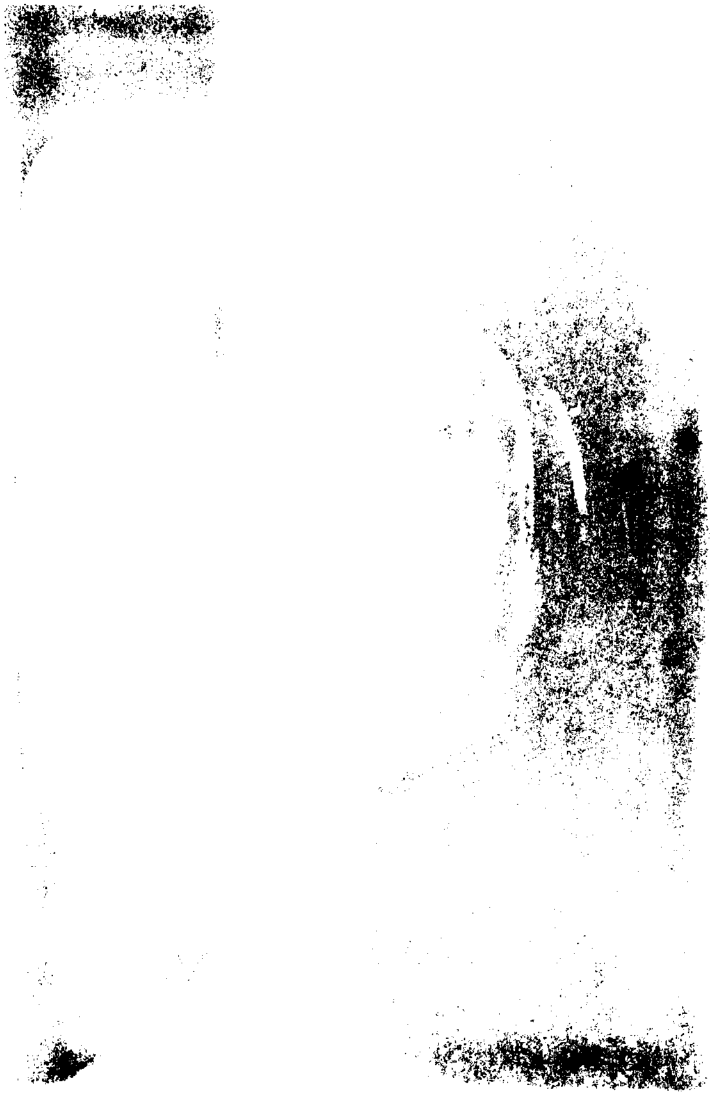

Figure 14a. Reflections on type II
lateral position [illegible]
ball at position [illegible]

[illegible] Reflections on type II
[illegible]
[illegible]

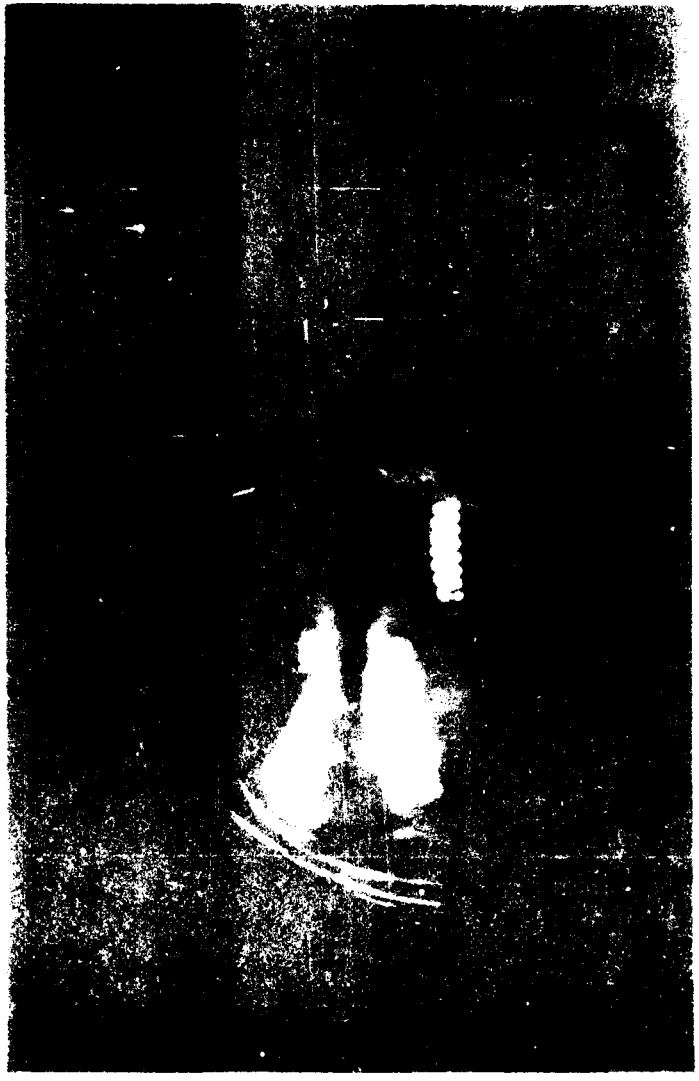

Figure 15b. Reflections on type III lateral position light bulb at position (5,5).

Figure 15a. Reflections on type III lateral position light bulb at position (0,0).

Photopic and scotopic luminous transmittances of the red, green, and clear dome filters were measured with a Photo Research 1980A photometer and an EG&G Gamma* RS-10 tungsten reference light source. The photopic and scotopic transmittances for the dome filters are: for the red dome, 29 and 2 percent; for the green dome, 18 and 40 percent; and for the clear dome, 89 and 88 percent, respectively. Figure 16 shows the relative spectral response of the Class A third generation image intensifier with relative spectral emittances of the red, green, and clear dome filters. In the relative response plots, it is apparent that the Class A night vision imaging systems (NVIS), with the 625 nm minus-blue filter, are highly responsive to light emitted through the red and clear filters, but not to light emitted through the green filter. Second generation I^2 tubes are responsive to light transmitted through the red, clear, and green filters due to their wide sensitivity range extending across the visible spectrum.

Conclusions and recommendations

The Army aviation community seeks a standard, permanent lighting strategy to satisfy training and mission needs for I^2 devices while maintaining adequate position light intensity distributions for detectability of aircraft while flying in the NAS. As stated earlier, certain exceptions are granted for training with lights out or on dim within restricted training areas. However, situations arise where, in transitioning from a staging area to a training area, controlled and uncontrolled airspace must be passed through at higher altitudes due to noise abatement programs. In these situations, light ng must be sufficient for unaided traffic detection.

The intensity distribution requirements for aircraft exterior position lighting are designed to provide optimum visibility for aircraft operating in the national airspace system. Current requirements were developed for civil airspace operations prior to the introduction of I^2 devices into aviation. These standards were defined with the intentions of maximizing unaided detection of aircraft in periods of reduced visibility and low illumination.

Nighttime operations, with or without image intensifiers, are distinct capabilities of U.S. Army aviation. In order for missions to be performed safely and efficiently, aircraft position lighting must be compatible in both the civilian and military operating arenas. The integration of image intensifiers into Army aviation has greatly expanded mission capabilities. However, due to the operating

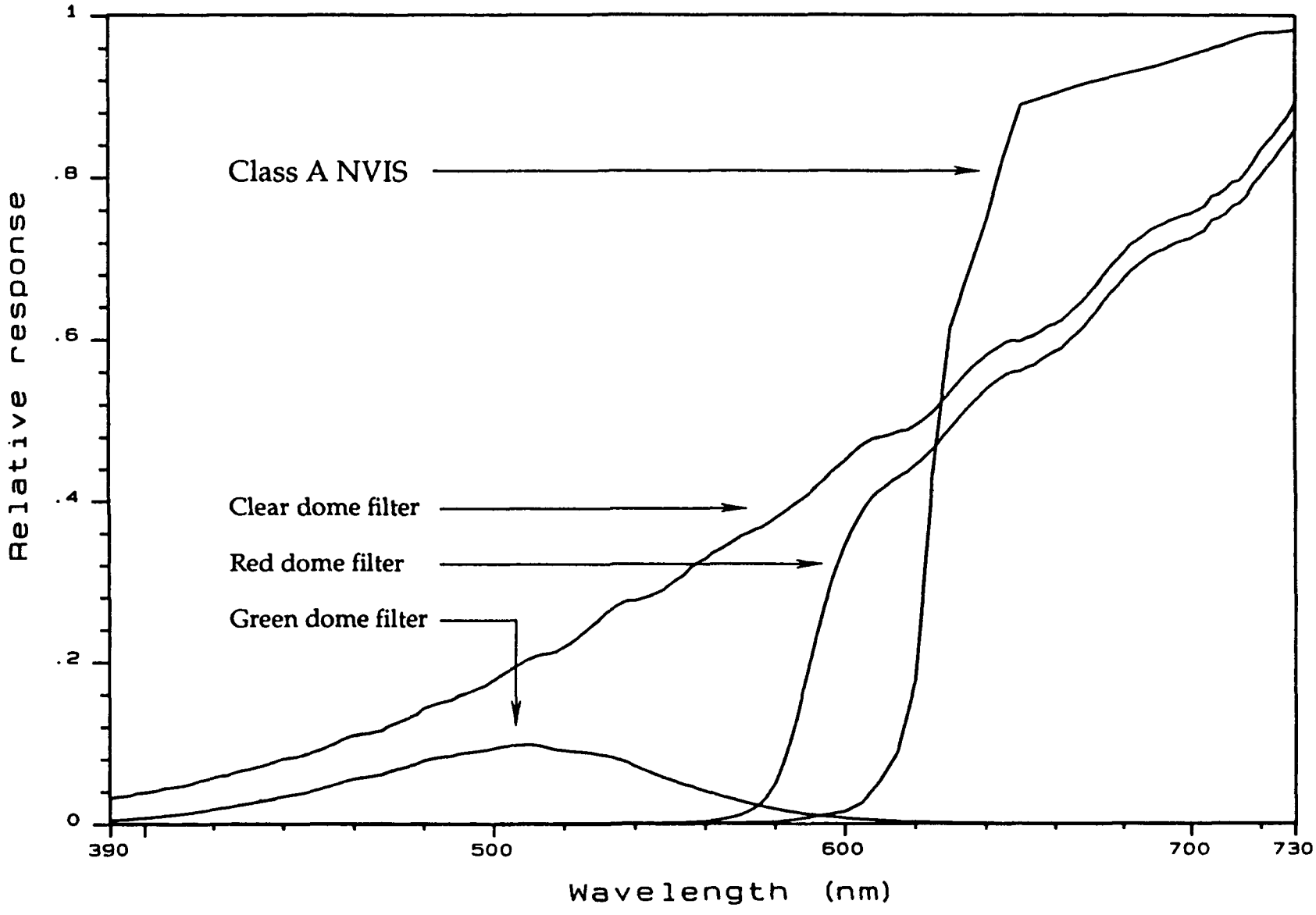

Figure 16. Relative response of Class A NVIS with red, green, and clear filtered tungsten light.

characteristics of I^2 devices, the prevailing configuration for position lighting is not compatible with and can have a negative impact on the safety of mission execution. A field survey (see Table 1) and this investigation show that the intensity and spectral distribution of the red and clear filtered position lights, in bright mode, are detrimental to I^2 operation. In attempts to alleviate the degradation of I^2 imagery by position light sources, the Army aviation community has modified lighting strategies to include operating with position lights in dim mode and operating with masked position lights in bright and dim modes.

Experience information in Table 1 shows that the impact of position light intensities on I^2 operations is most significant in formation flying. Members of the Army aviation community have applied masking techniques and operate with position lights in dim mode to alleviate problems with I^2 devices in formation flying. The objective intensity distribution measurements performed in this laboratory investigation show that in dim mode intensities do not meet FAA requirements in the critical regions of the individual light units.

Dim mode is one of three selectable positions on Army rotorcraft (bright, dim, and off). Although intensities in the current dim mode fall below FAA requirements for flying in the NAS, incrementally dimmed steps between bright and dim modes are potentially feasible and offer a potential solution to the problem. Naval rotorcraft use a seven-step dimming switch where intensity at each dimming step is one-half that of the next higher step (Kinney and Simpson, 1992). The primary exterior lighting specification for naval aircraft is MIL-L-006730C, which is based upon the same FAA intensity requirements as the Army specification MIL-L-6503H. Variable dimming on Army rotorcraft would allow flexibility for I^2 operations in variable and restrictive environments.

The measured intensity distribution profiles for the masked configurations evaluated show that paint and tape masking modify the position light intensity distributions in such a way that requirements in applicable FARs are no longer achieved in all areas of the distribution profiles. The paint and tape materials used in these masking configurations are very dense and decrease light intensity by blocking or by absorbing light energy. As an alternative to this type of masking, a lighter frost coating could be applied to the red and clear position light domes. Transmittance is decreased through a frosted dome and emitted light is diffused so that mean light intensity is diminished. The color of emitted light will not be modified by a frosted dome.

Currently, the FARs define intensity requirements for individual light units measured from "dead ahead" within angular cones of 110° horizontal by ±90° vertical for the lateral position lights and 140° horizontal by ±90° vertical for the tail position lights. With these requirements as they are defined, any masking of the position lights is unacceptable with respect to FAA regulations. It may be possible to develop acceptable modified lighting for I^2 compatibility via the modification of the current requirements definition and/or a compromise of the requirements. This could be achieved by defining a positionable center of measurement for the intensity cone which would grant the flexibility of allowing partial masking. For instance, allowing the cone vertex to be positionable within the light bulb front perimeter and perpendicular to the front vertical plane of each position light (as mounted on the rotorcraft in normal flying orientation) would allow masking configurations, such as those in Figures 1a and 1c-e, to be feasible. However, because the horizontal and vertical angular intensity requirements are designed to optimize aircraft visibility in all directions within a 360° sphere, moving of angular cone vertices alone will not qualify partial masking. A compromise on intensity distribution requirements would be necessary.

The problem of light flooding into the cockpit/crew compartment from the lateral position lights on the UH-1 and UH-60 is attributable to the location of the light units above and/or below the crew doors (Table 2). FARs specify that forward position lights be spaced as far apart laterally as practicable. On the UH-1 and UH-60 rotorcraft, the greatest lateral distances are across the midsection of the fuselage since there are no wings or horizontal stabilizers in the forward area as there are with the OH-58, AH-1, and fixed-wing aircraft. An alternative to masking for alleviating this problem would be to relocate the lateral position light units so that light emitted into the cockpit/crew compartment is reduced or eliminated.

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Department of the Army. 1988. Technical Manual, Operator's manual: UH-60A and EH-60A helicopter, TM 55-1520-237-10. Washington, DC.

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Department of Defense. 1988. Military Specification, MIL-L-6503H. Lighting equipment, aircraft, general specification for installation of. Washington, DC.

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Department of Transportation, Federal Aviation Administration. Code of Federal Regulations, Federal Aviation Regulation. Airworthiness standards, transport category rotorcraft. Chapter 14, section 29, paragraphs 1387-1393. Washington, DC.

Kinney, S., and Simpson, R. 1992. Integration of exterior lighting systems and night vision imaging systems. Patuxent River, MD: Naval Air Warfare Center Aircraft Division TM 92-37 SY.

Rash, C. E., and Martin, J. S. 1991. ANVIS lighting report: AH-64 and UH-1 components, sample set 1. Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory LR 91-5-2-5.

Rash, C. E., and Snook, E. H. 1992. ANVIS lighting report: Auxiliary lighting program, finger/lip lights, flashlight filters, preproduction testing. Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory LR 92-6-2-1.

Rash, C. E., and Verona, R. W. 1989. Cockpit lighting compatibility with image intensification night imaging systems: issues and answers. Helmet-mounted displays. Carollo, J. T., ed. Proceedings of SPIE, vol. 1116, pp. 170-175.

Verona, R. W., and Rash, C. E. 1989. Human factors and safety considerations of night vision systems flight. Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory report no. 89-12.

Apprendix A-1.

Tasking document number 1

ATZQ-ATB-NS

27 August 1992
CW4 Colbert/mnc/5858

MEMORANDUM FOR DIR, USAARL

SUBJECT: Aircraft Position and Anticollision Light Masking

1. The Night Vision Device Branch (NVDB) of the Aviation Training Brigade is developing a standard masking configuration of position and anticollision lights of Army helicopters (TAB A). These masked lights will be used principally for night vision goggle single-ship and multi-ship operations. The goal of this project is to provide Army aviation units an external light configuration which may be applied permanently and which will satisfy unit training needs as well as the lighting requirements of the Federal Aviation Administration (FAA).

2. The enclosed extract of the applicable Federal Aviation Regulations (FARs) (TAB B) states the specifications for civil rotorcraft external lighting requirements. The enclosed sketches of proposed modifications may not meet the minimum requirements of the FARs. Therefore, I request that external aircraft lights with these modifications applied be measured using a criteria similar to those listed in the FARs.

3. POC: CW4 Colbert, NVDB, 5858/5812.

Encls
as

THOMAS M. ROY
COL, AV
Commanding

Appendix A-2.

Tasking document number 2

ATZQ-ATB-NS

19 May 1993
CW4 Colbert/hn/5858

MEMORANDUM FOR DIR, USAARL

SUBJECT: Aircraft Adaptive Position Lighting for Night Vision Goggle Flight

1. The Night Vision Device Branch (NVDB) of the Aviation Training Brigade seeks to develop an adaptive position lighting policy for night vision goggle (NVG) flight. Adaptive position lighting strategies include, but are not limited to, dim mode operation, partial masking, and aided/unaided compatible filtering of helicopter position lighting. The goal of this project is to provide Army aviation units with adaptive lighting configurations which may be applied to satisfy unit training needs as well as Federal Aviation Administration (FAA) lighting requirements.

2. Partially masked and dim mode position light configurations are frequently used during NVG multi-aircraft operations. Enclosed are sketches of commonly used masked aircraft position light configurations.

3. NVDB requests a laboratory evaluation of the enclosed configurations and the dim position light mode utilizing the requirements specified in the attached Federal Aviation Regulations (FAR) extracts.

4. POC CW4 Colbert, NVDB, 5858/5812.

THOMAS M. ROY
COL, AV
Commanding

Encl
as

Appendix B.

List of manufacturers

EG&G Gamma Scientific Inc.
3777 Ruffin Rd.
San Diego, CA 92123

Fluke, John
4515 Culver
Rochester, NY 14622

Grimes Aerospace Corporation
550 Route 55
P.O. Box 247
Urbana, OH 43078

Hewlett-Packard
3000 Hanover St.
20 DM/P.O. Box 10301
Palo Alto, CA 94303

Minolta Corporation
101 Williams Dr.
Ramsey, NJ 07446

Optron Corporation
30 Hazel Terrace
Woodbridge, CT 06525

Photo Research
Division of Kollmorgen
9330 DeSoto Ave.
P.O. Box 2192
Chatsworth, CA 91313-2192

Appendix C.

Light intensity definition

Light intensity is the luminous flux being emitted from a point source, where light flux is the rate of flow of visible energy. The basic unit of flux is the lumen, which by definition is equal to $\frac{1}{4\pi}$ times the total flux emitted by a uniform point source of one candelas. The flux emitted by a point source per unit solid angle (steradian) is called intensity. A steradian is defined as that solid angle originating at the center of a sphere and subtending an area on the sphere surface equal to the square of the sphere radius (Figure C-1). Intensity is measured in lumens per steradian, and a uniform point source equal to one candela has an intensity in every direction of one lumen per steradian. Intensity in a given direction is usually expressed in candela and is often called candlepower.

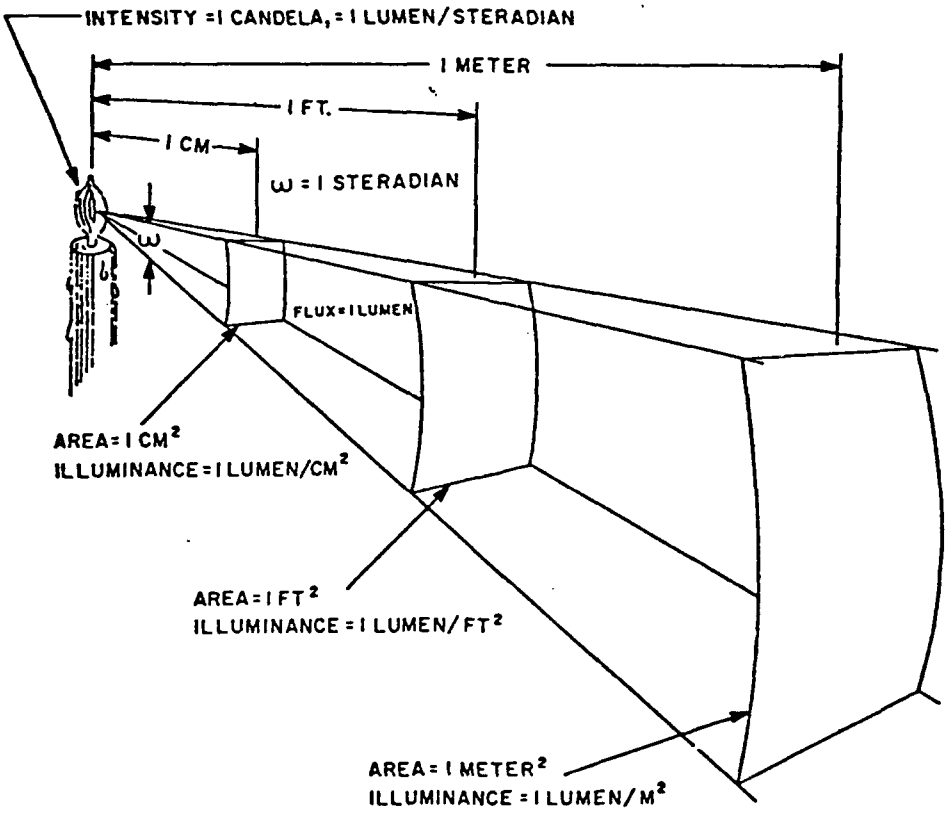

Figure C-1. Relationship between intensity and illumination.

The luminous flux density received on a surface (illuminance) varies with the intensity of the source and inversely as the square of the distance from the source to the surface. Illuminance is expressed in lumens per unit area or footcandles. Figure C-1 shows that as the distance from a source increases, one lumen is spread over increasing areas, and the illuminance decreases. The relationship between illuminance and distance from the source is referred to as the "inverse square law." The illuminance from a given source on a surface varies inversely as the square of the distance between the source and the surface.

The measurement of intensity of a source is generally done indirectly with instrumentation which measures illuminance. Therefore, using the inverse square law and knowing the distance between the source and the instrument detector, intensity of the light source can be calculated by multiplying measured illuminance (in footcandles) times the distance squared to get intensity (in candela).

$$\text{Illuminance (footcandles)} = \frac{\text{intensity of source (candelas)}}{\text{distance (feet)}^2}$$

For more information, refer to:

Applied optics: a guide to optical system design (Vol. 1 and 2), 1968. Levi, Leo. New York, NY: John Wiley and Sons.

IES lighting handbook (Vol. 1 and 2), 1987. Kaufman, J. K., and Christensen, J. F., eds. New York, NY: Illuminating Engineering Society of North America.

Rash, C. E., Snook, E. H., Senn, P. M., and McGowin, E. 1992. USAARL guide for making laboratory light measurements. Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory report no. 92-34.

Appendix D.

Intensity profiles, illuminance measurements, and calculated intensities for OH-58D/UH-60 left (red) lateral position light.

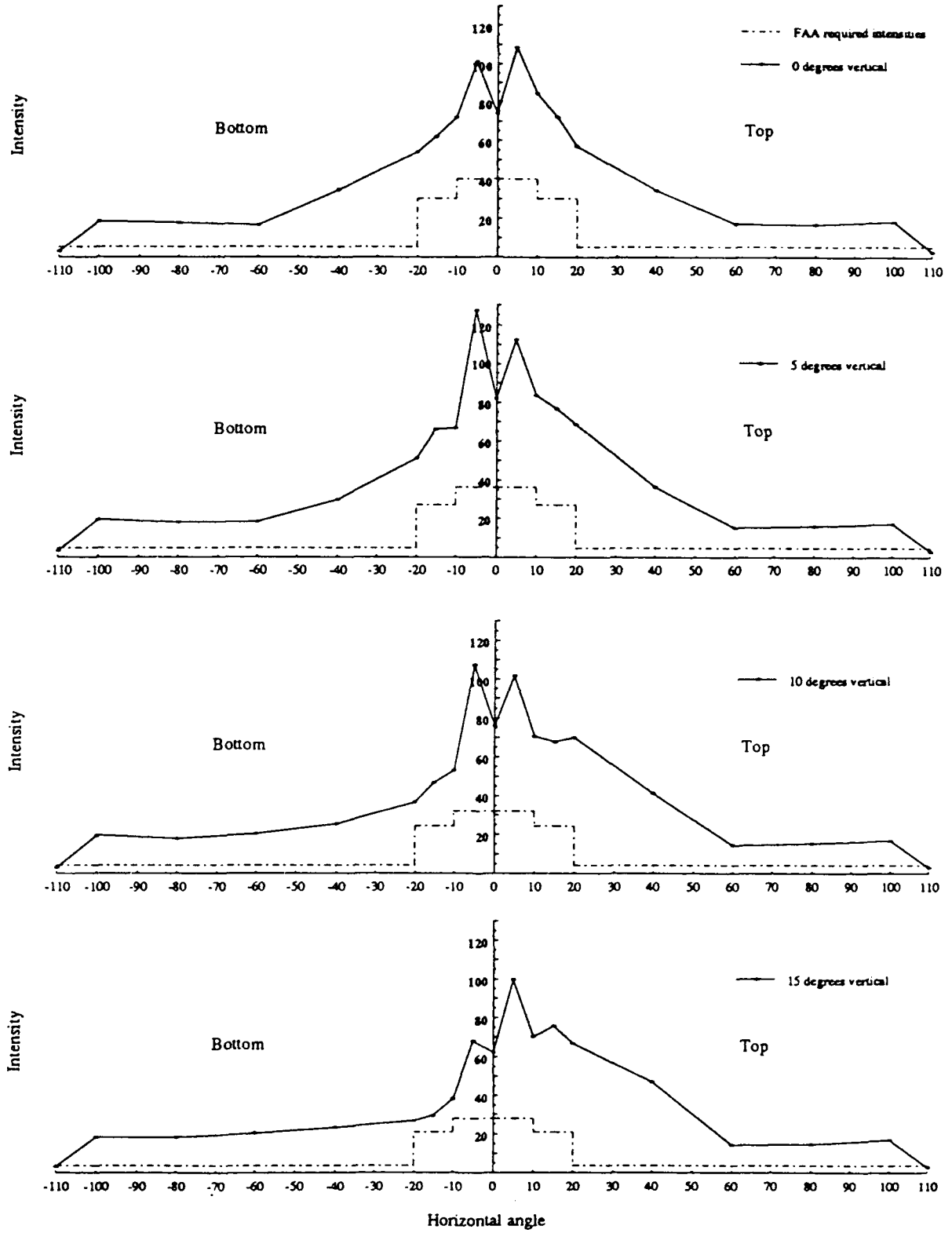

Figure D-1a. Intensity profiles for OH-58D/UH-60 red, unmasked lateral position light in bright mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

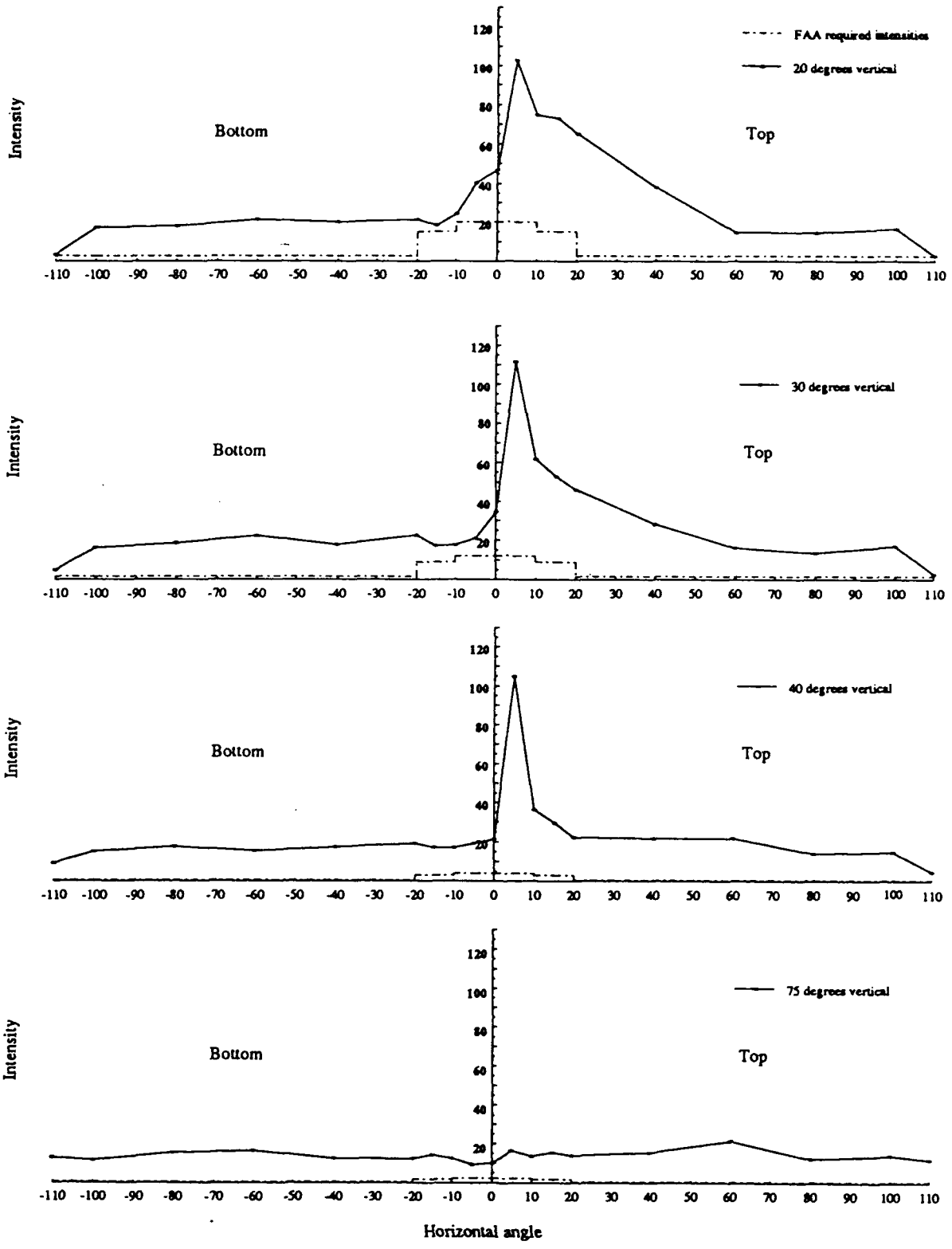

Figure D-1b. Intensity profiles for OH-58D/UH-60 red, unmasked lateral position light in bright mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

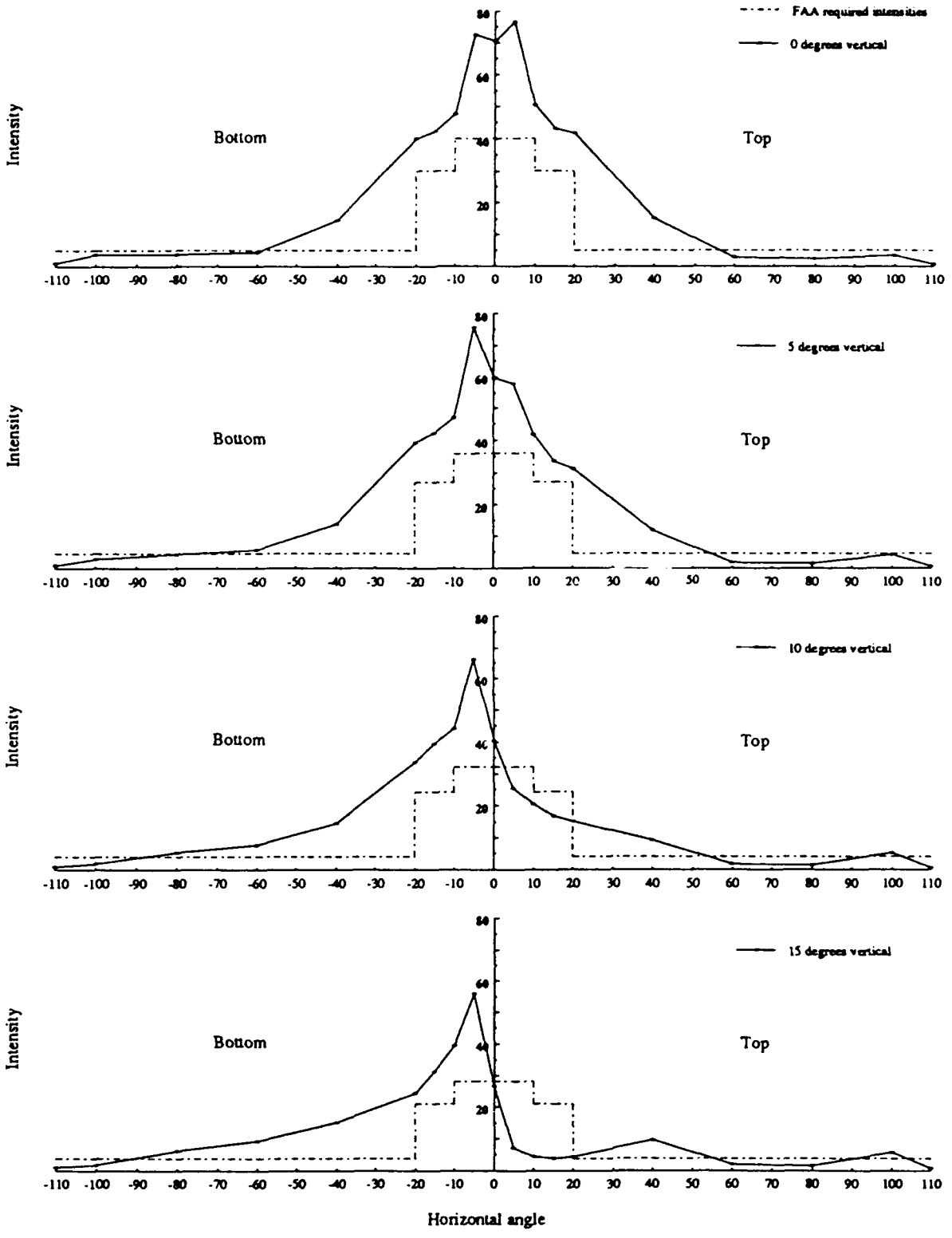

Figure D-2a. Intensity profile for OH-58D/UH-60 red, half-masked lateral position light in bright mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

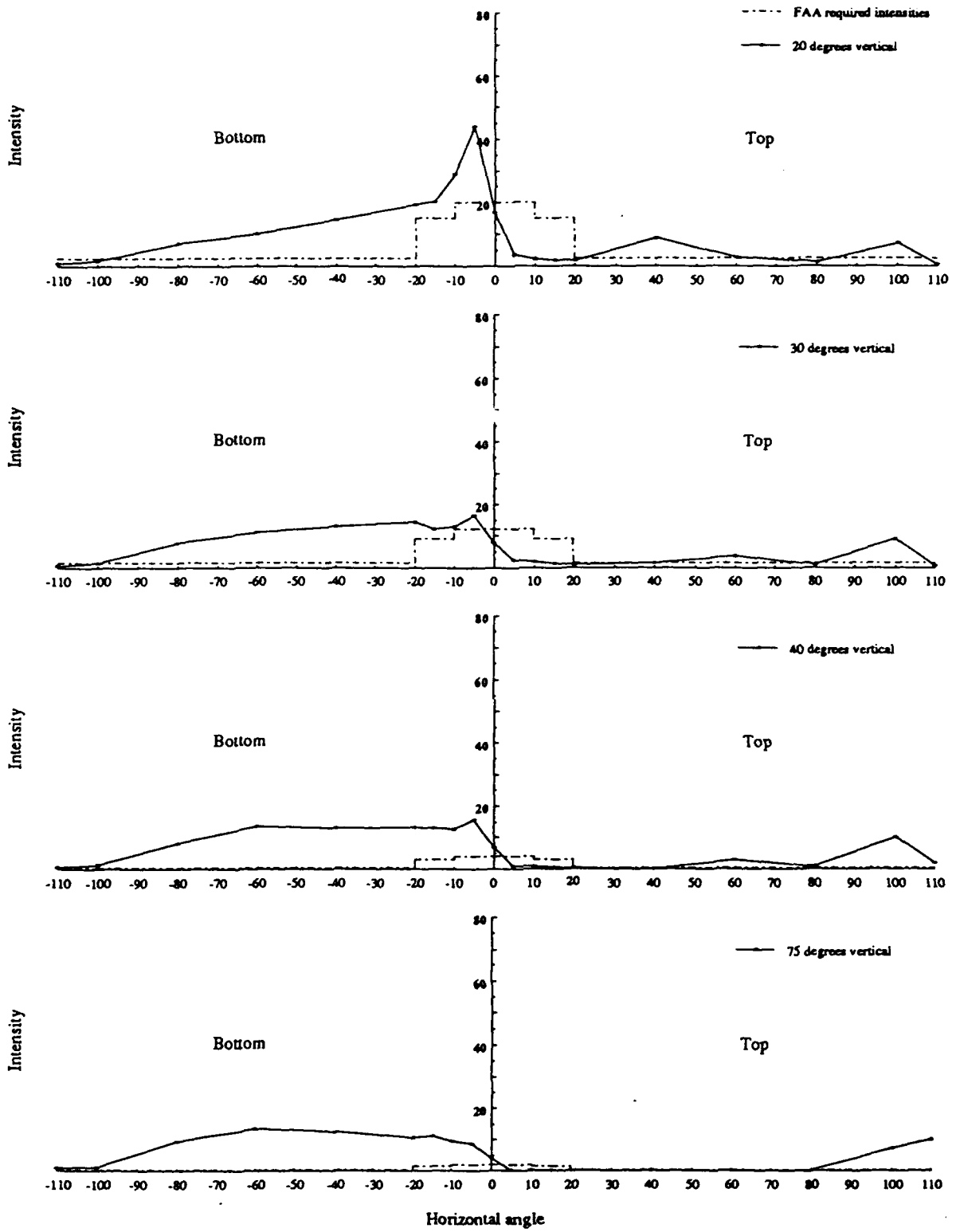

Figure D-2b. Intensity profiles for OH-58D/UH-60 red, half-masked lateral position light in bright mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

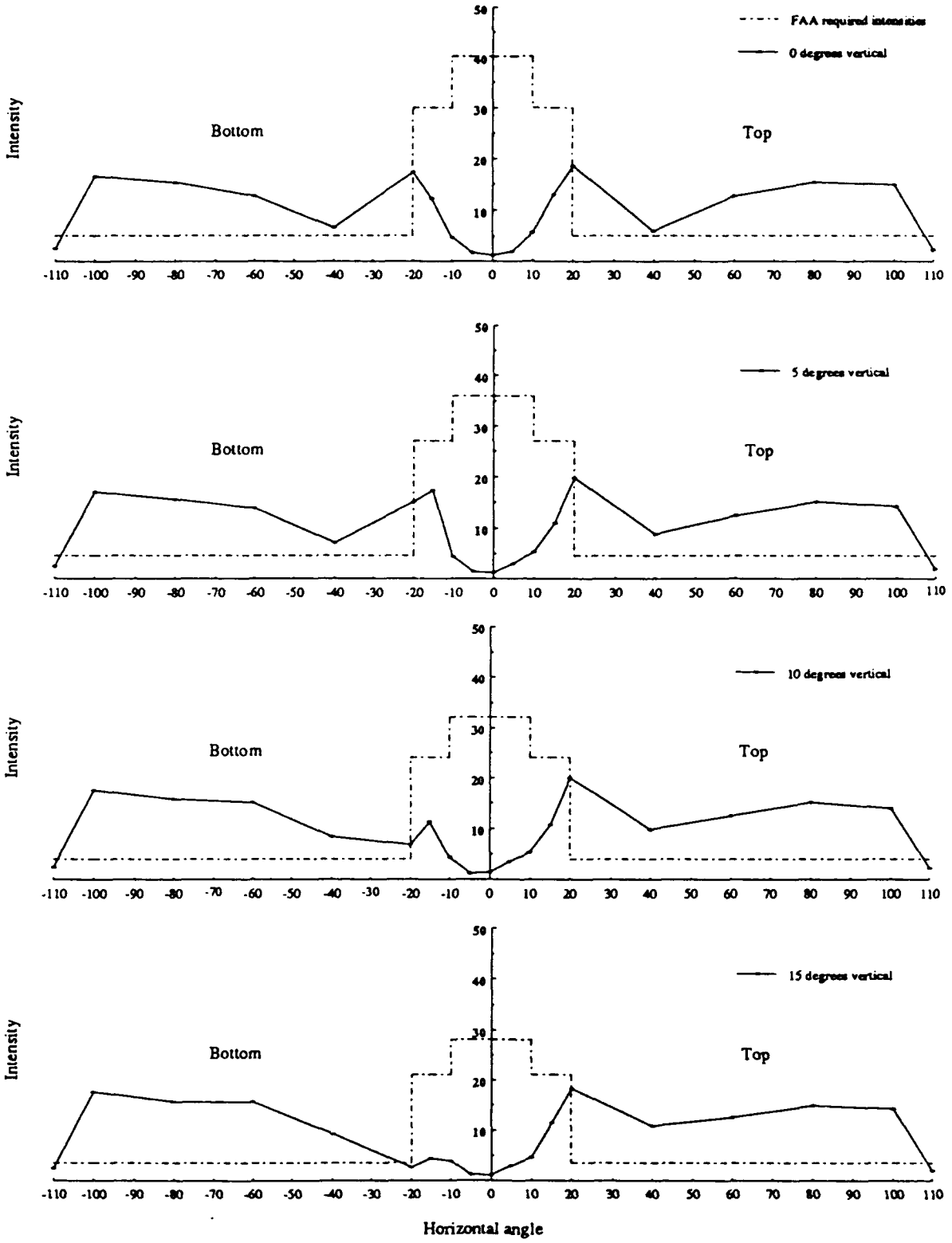

Figure D-3a. Intensity profiles for OH-58D/UH-60 red, front-masked lateral position light in bright mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

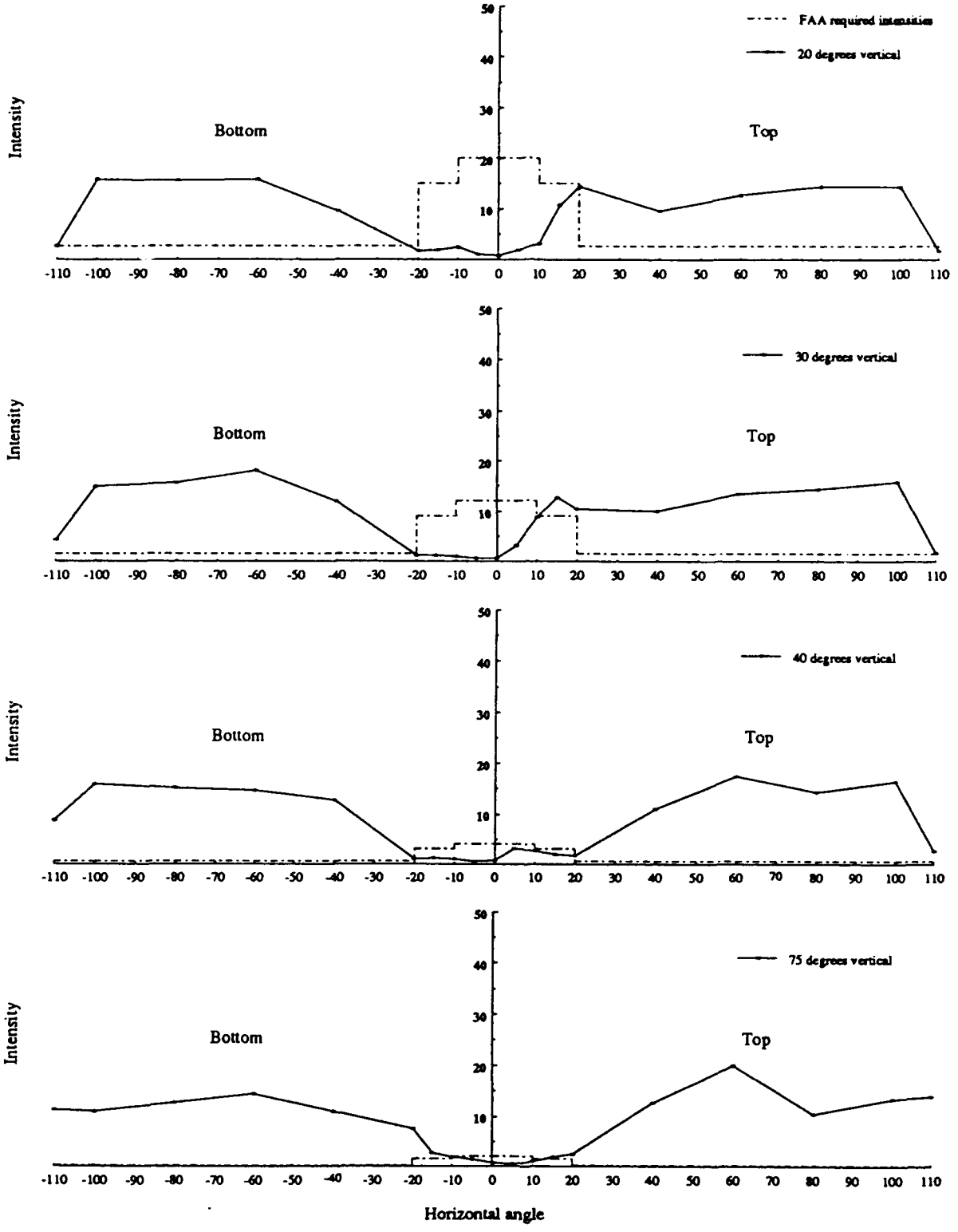

Figure D-3b. Intensity profiles for OH-58D/UH-60 red, front-masked lateral position light in bright mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

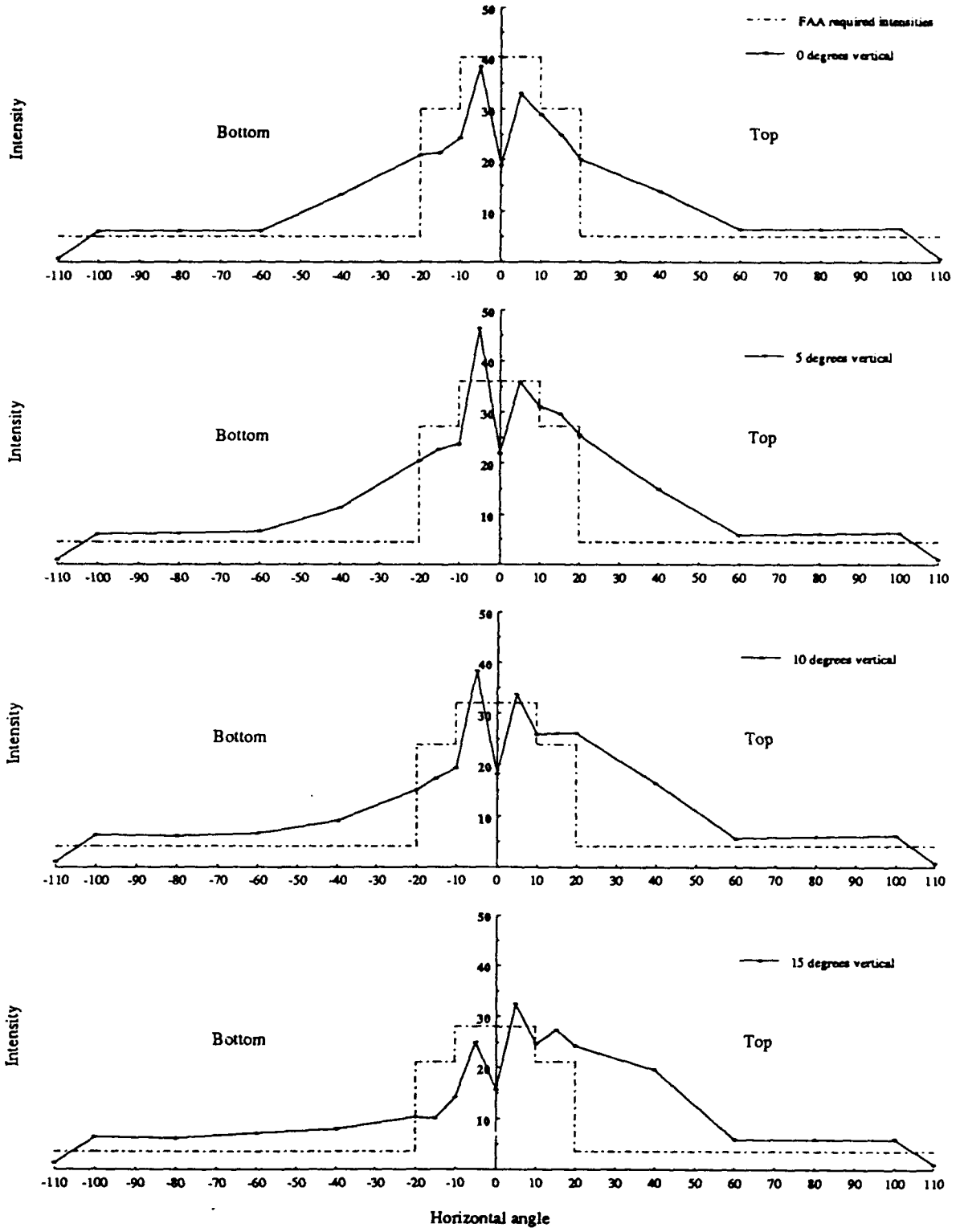

Figure D-4a. Intensity profiles for OH-58D/UH-60 red, unmasked lateral position light in dim mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

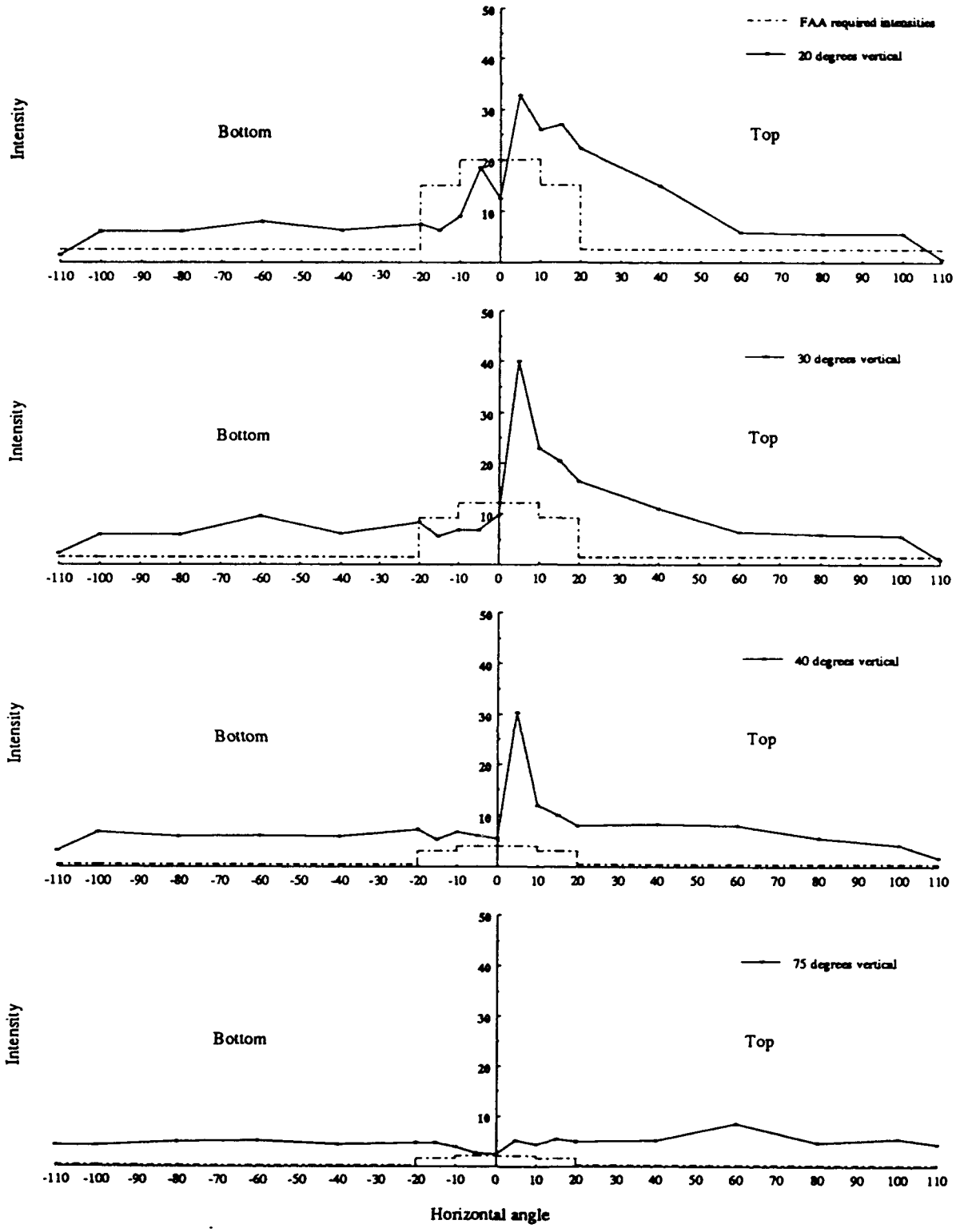

Figure D-4b. Intensity profiles for OH-58D/UH-60 red, unmasked lateral position light in dim mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

Table D-1a.

Measured data and calculated intensity values for OH-58D/UH-60 lateral position light, red dome configurations, single samples; unmasked and half-masked, bright. Intensity expressed in candelas.

UNMASKED/BRIGHT — Instrument readings — 2 Nov. 1992

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	306	444	345	295	234	140	70	69	75	12
e	5	347	459	342	313	280	148	62	65	70	12
r	10	299	416	289	278	286	169	59	63	69	12
t	15	277	407	288	310	273	192	59	60	69	12
	20	261	419	306	298	266	155	60	59	68	11
TOP	30	224	456	253	216	188	116	67	56	70	11
	40	118	429	149	121	92	90	90	58	62	19
	75	47	68	56	64	57	64	89	51	57	49
	90										

d=15.6354' — candle power values

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	74.81	108.54	84.34	72.12	57.20	34.23	17.11	16.87	18.33	2.93
e	5	84.83	112.21	83.61	76.52	68.45	36.18	15.16	15.89	17.11	2.93
r	10	73.10	101.70	70.65	67.96	69.92	41.31	14.42	15.40	16.87	2.93
t	15	67.72	99.50	70.41	75.78	66.74	46.94	14.42	14.67	16.87	2.93
	20	63.81	102.43	74.81	72.85	65.03	37.89	14.67	14.42	16.62	2.69
TOP	30	54.76	111.48	61.85	52.80	45.96	28.36	16.38	13.69	17.11	2.69
	40	28.85	104.88	36.43	29.58	22.49	22.00	22.00	14.18	15.16	4.64
	75	11.49	16.62	13.69	15.65	13.93	15.65	21.76	12.47	13.93	11.98
	90										

HALF MASKED/BRIGHT — Instrument readings

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	335	313	207	177	171	62	12	10	14	3
e	5	270	237	171	137	128	49	7	6	17	3
r	10	110	104	84	68	62	38	7	6	21	3
t	15	39	29	18	15	18	39	8	6	23	3
	20	19	14	9	8	7	36	11	5	29	3
TOP	30	11	10	8	5	4	6	15	4	37	3
	40	4	4	4	3	2	1	12	4	41	8
	75	1	1	1	1	1	1	1	1	30	42
	90										

d=15.6354' — candle power values

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	81.90	76.52	50.60	43.27	41.80	15.16	2.93	2.44	3.42	0.73
e	5	66.01	57.94	41.80	33.49	31.29	11.98	1.71	1.47	4.16	0.73
r	10	26.89	25.42	20.54	16.62	15.16	9.29	1.71	1.47	5.13	0.73
t	15	9.53	7.09	4.40	3.67	4.40	9.53	1.96	1.47	5.62	0.73
	20	4.64	3.42	2.20	1.96	1.71	8.80	2.69	1.22	7.09	0.73
TOP	30	2.69	2.44	1.96	1.22	0.98	1.47	3.67	0.98	9.05	0.73
	40	0.98	0.98	0.98	0.73	0.49	0.24	2.93	0.98	10.02	1.96
	75	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	7.33	10.27
	90										

Instrument readings — 5 Nov. 1992

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	300	413	295	254	220	142	68	72	76	13
e	5	322	521	273	270	209	121	75	73	79	13
r	10	323	438	217	190	149	104	83	73	80	12
t	15	230	279	157	121	110	96	84	76	76	13
	20	122	165	99	76	88	82	88	75	71	14
BTM	30	59	87	73	71	93	73	92	77	67	21
	40	57	79	70	70	79	71	64	72	63	38
	75	35	38	52	58	51	52	68	64	48	53
	90										

d= 15.6354' — candle power values

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	73.34	100.96	72.12	62.09	53.78	34.71	16.62	17.60	18.58	3.18
e	5	78.72	127.37	66.74	66.01	51.09	29.58	18.33	17.85	19.31	3.18
r	10	78.96	107.08	53.05	46.45	36.43	25.42	20.29	17.85	19.56	2.93
t	15	56.23	68.21	38.38	29.58	26.89	23.47	20.54	18.58	18.58	3.18
	20	29.82	40.34	24.20	18.58	21.51	20.05	21.51	18.33	17.36	3.42
BTM	30	14.42	21.27	17.85	17.36	22.74	17.85	22.49	18.82	16.38	5.13
	40	13.93	19.31	17.11	17.11	19.31	17.36	15.65	17.60	15.40	9.29
	75	8.56	9.29	12.71	14.18	12.47	12.71	16.62	13.65	11.73	12.96
	90										

Instrument readings — 5 Nov. 1992

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	241	297	196	173	164	60	18	15	15	4
e	5	218	310	194	173	161	57	24	18	12	4
r	10	220	271	181	161	137	59	31	22	8	4
t	15	179	229	162	128	100	62	38	25	7	4
	20	119	180	119	83	79	60	42	29	7	4
BTM	30	54	68	53	50	59	53	46	32	6	3
	40	52	64	52	53	54	53	56	34	6	3
	75	32	35	39	46	44	52	56	39	5	4
	90										

d= 15.625' — candle power values

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	58.84	72.51	47.85	42.24	40.04	14.65	4.19	3.66	3.66	0.98
e	5	53.22	75.68	47.36	42.24	39.31	13.92	5.86	4.39	2.93	0.98
r	10	53.71	66.16	44.19	39.31	33.45	14.40	7.57	5.37	1.95	0.98
t	15	43.70	55.91	39.55	31.25	24.41	15.14	9.28	6.10	1.71	0.98
	20	29.05	43.95	29.05	20.26	19.29	14.65	10.25	7.08	1.71	0.98
BTM	30	13.18	16.60	12.94	12.21	14.40	12.94	11.23	7.81	1.46	0.73
	40	12.70	15.63	12.70	12.94	13.18	12.94	13.67	8.30	1.46	0.73
	75	7.81	8.54	9.52	11.23	10.74	12.70	13.67	9.52	1.22	0.98
	90										

Table D-1b.

Measured data and calculated intensity values for OH-58D/UH-60 lateral position light, red dome configurations, single samples; front-masked, bright and unmasked, dim. Intensity expressed in candelas.

FRONT MASKED/BRIGHT — Instrument readings — 5 Nov. 1993

		CW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	5	8	23	53	76	24	52	63	61	9
e	5	6	12	22	45	81	36	51	62	58	8
r	10	8	14	22	44	82	40	51	62	57	9
t	15	6	12	19	47	75	44	51	61	58	8
	20	4	8	13	44	59	39	52	59	59	7
TOP	30	4	13	36	52	43	41	55	59	65	7
	40	3	13	11	8	7	45	71	58	67	11
	75	2	2	4	8	10	52	82	43	55	57
	90										

FRONT MASKED/BRIGHT — candle power values — d=15.6354' — 5 Nov. 1993

		CW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	1.22	1.96	5.62	12.96	18.58	5.87	12.71	15.40	14.91	2.20
e	5	1.47	2.93	5.38	11.00	19.80	8.80	12.47	15.16	14.18	1.96
r	10	1.96	3.42	5.38	10.76	20.05	9.78	12.47	15.16	13.93	2.20
t	15	1.47	2.93	4.64	11.49	18.33	10.76	12.47	14.91	14.18	1.96
	20	0.98	1.96	3.18	10.76	14.42	9.53	12.71	14.42	14.42	1.71
TOP	30	0.98	3.18	8.80	12.71	10.51	10.02	13.45	14.42	15.89	1.71
	40	0.73	3.18	2.69	1.96	1.71	11.00	17.36	14.18	16.38	2.69
	75	0.49	0.49	0.98	1.96	2.44	12.71	20.05	10.51	13.45	13.93
	90										

UNMASKED/DIM — Instrument readings — 25 Nov. 1992

		CW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	93	135	118	102	82	57	26	26	27	3
e	5	109	147	127	121	104	61	24	25	26	4
r	10	83	138	106	107	107	67	23	24	25	3
t	15	79	133	101	112	99	80	24	24	24	4
	20	73	134	106	110	91	61	24	23	23	3
TOP	30	64	164	93	83	67	45	26	24	23	4
	40	30	124	49	41	33	34	33	23	17	7
	75	11	21	18	22	20	21	35	19	22	18
	90										

UNMASKED/DIM — candle power values — d= 15.625' — 25 Nov. 1992

		CW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	22.71	32.96	28.81	24.90	20.02	13.92	6.35	6.35	6.59	0.73
e	5	26.61	35.89	31.01	29.54	25.39	14.89	5.86	6.10	6.35	0.98
r	10	20.26	33.69	25.88	26.12	26.12	16.36	5.62	5.86	6.10	0.73
t	15	19.29	32.47	24.66	27.34	24.17	19.53	5.86	5.86	5.86	0.98
	20	17.82	32.71	25.88	26.86	22.22	14.89	5.86	5.62	5.62	0.73
TOP	30	15.63	40.04	22.71	20.26	16.36	10.99	6.35	5.86	5.62	0.98
	40	7.32	30.27	[illegible]	10.01	8.06	8.30	8.06	5.62	4.15	1.71
	75	2.69	5.13	4.39	5.37	4.88	5.13	8.54	4.64	5.37	4.39
	90										

[illegible]

UNMASKED/BRIGHT — Instrument readings — 24 Nov. 1992

		CCW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	5	7	19	50	71	27	52	63	68	10
e	5	4	6	18	71	62	29	57	64	70	10
r	10	4	5	18	46	28	34	62	65	72	10
t	15	3	5	16	18	11	38	64	64	72	10
	20	3	4	10	8	7	39	65	64	65	11
BTM	30	2	3	4	5	5	49	74	64	61	18
	40	3	2	4	5	4	52	60	62	65	36
	75	4	6	8	11	31	45	59	52	45	46
	90										

UNMASKED/BRIGHT — candle power values — d= 15.625' — 24 Nov. 1992

		CCW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	1.22	1.71	4.64	12.21	17.33	6.59	12.70	15.38	16.60	2.44
e	5	0.98	1.46	4.39	17.33	15.14	7.08	13.92	15.63	17.09	2.44
r	10	0.98	1.22	4.39	11.23	6.84	8.30	15.14	15.87	17.58	2.44
t	15	0.73	1.22	3.91	4.39	2.69	9.28	15.63	15.63	17.58	2.44
	20	0.73	0.98	2.44	1.95	1.71	9.52	15.87	15.63	15.87	2.69
BTM	30	0.49	0.73	0.98	1.22	1.22	11.96	18.07	15.63	14.89	4.39
	40	0.73	0.49	0.98	1.22	0.98	12.70	14.65	15.14	15.87	8.79
	75	0.98	1.46	1.95	2.69	7.57	10.99	14.40	12.70	10.99	11.23
	90										

UNMASKED/BRIGHT — candle power values — d= 15.625' — 24 Nov. 1992

		CCW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	15.14	38.33	24.41	21.48	21.00	13.18	6.10	6.10	6.10	0.73
e	5	17.09	46.39	23.68	22.71	20.51	11.23	6.59	6.35	6.10	0.98
r	10	16.11	38.33	19.29	17.33	15.14	9.03	6.59	6.10	6.35	0.98
t	15	11.96	24.90	14.16	10.01	11.96	7.81	7.08	6.10	6.35	1.22
	20	7.08	18.55	9.03	6.35	8.55	6.35	8.06	6.10	6.10	1.46
BTM	30	3.91	6.84	6.84	5.62	8.30	6.10	9.52	5.86	5.86	2.20
	40	3.66	6.10	6.84	5.37	7.32	5.86	6.10	5.86	6.84	3.17
	75	2.20	2.69	3.91	4.64	4.64	4.39	5.13	4.88	4.15	4.15
	90										

Appendix E.

Intensity profiles, illuminance measurements, and calculated intensities for OH-58D/UH-60 right (green) lateral position light.

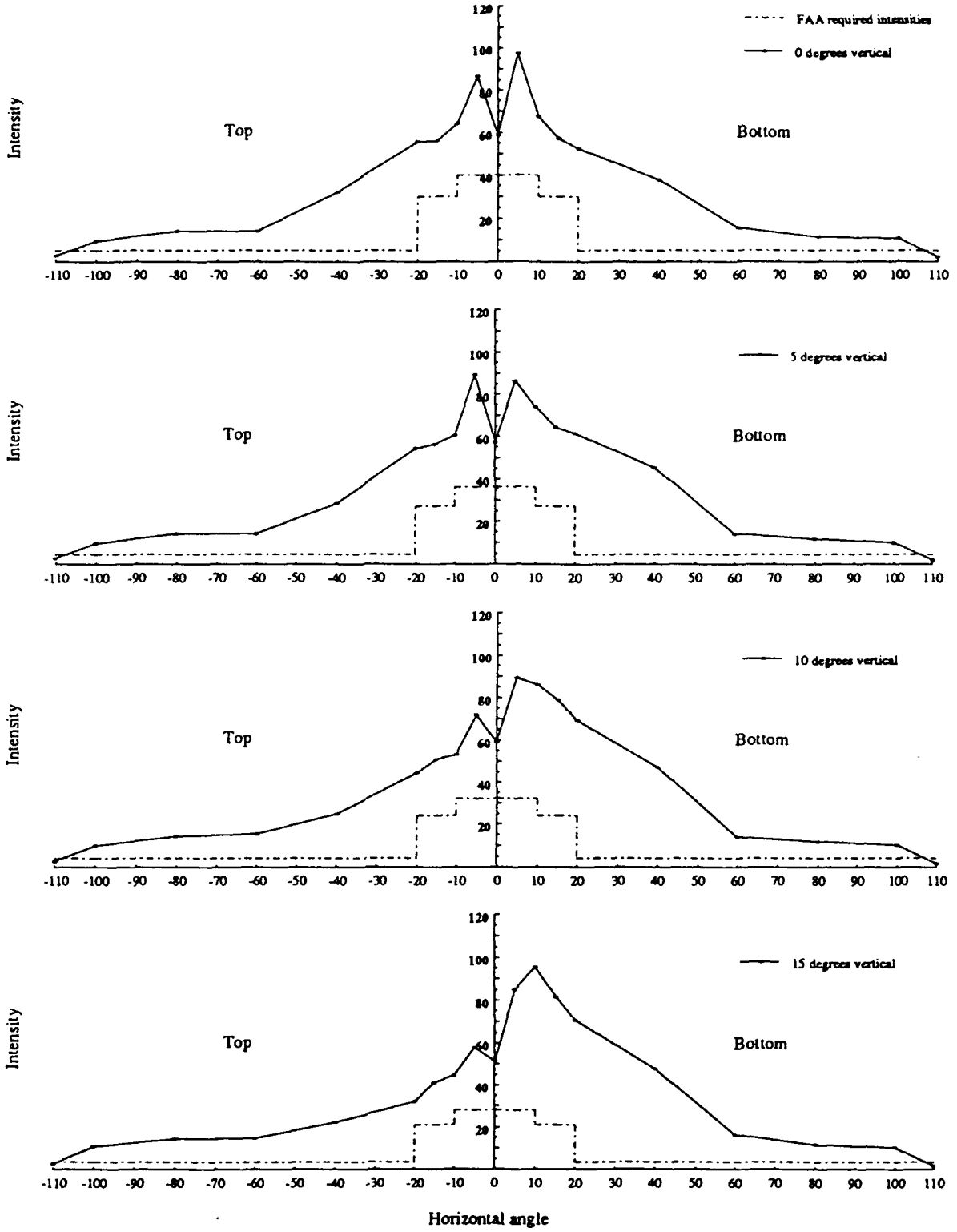

Figure E-1a. Intensity profiles for OH-58D/UH-60 green, unmasked lateral position light in bright mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

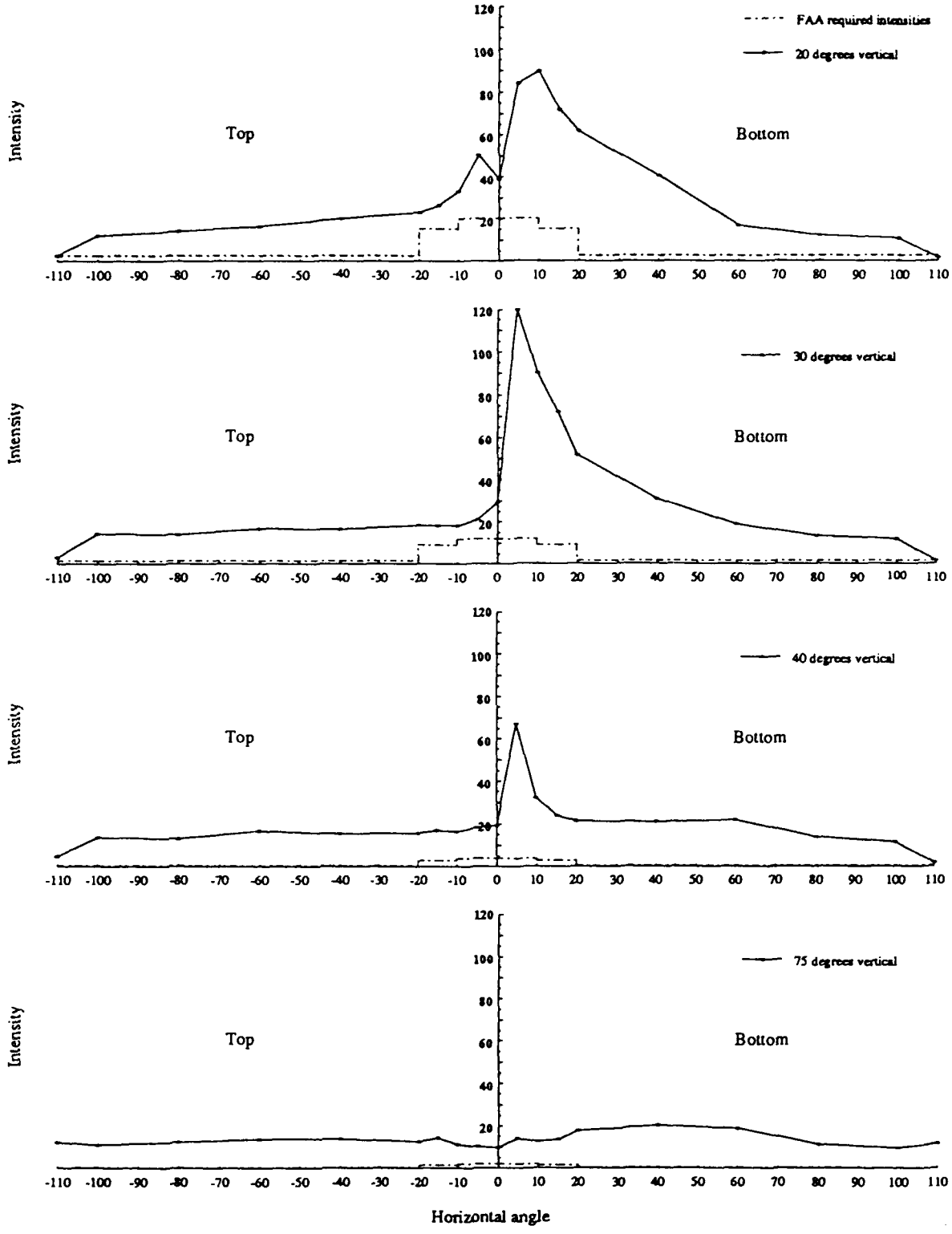

Figure E-1b. Intensity profiles for OH-58D/UH-60 green, unmasked lateral position light in bright mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

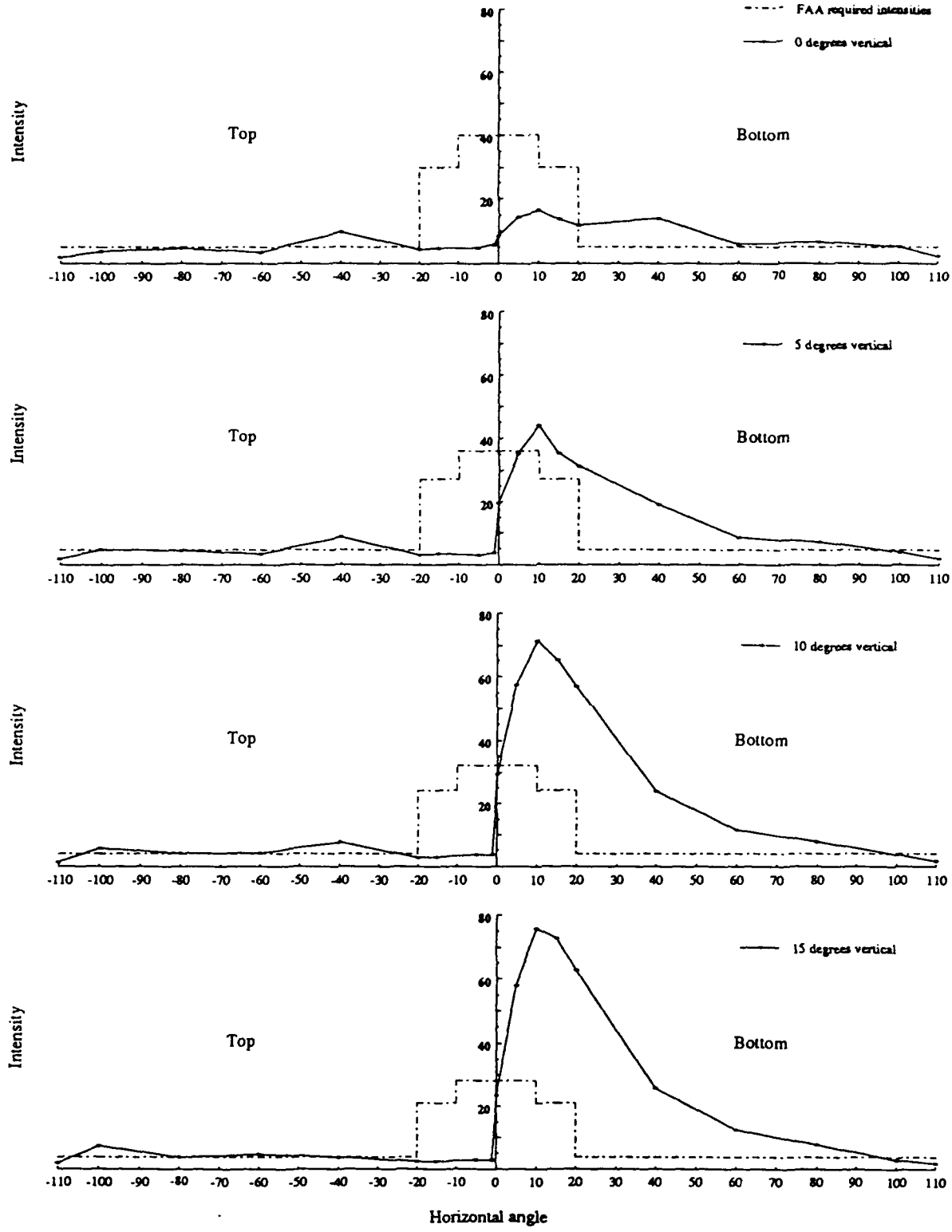

Figure E-2a. Intensity profiles for OH-58D/UH-60 green, half-masked lateral position light in bright mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

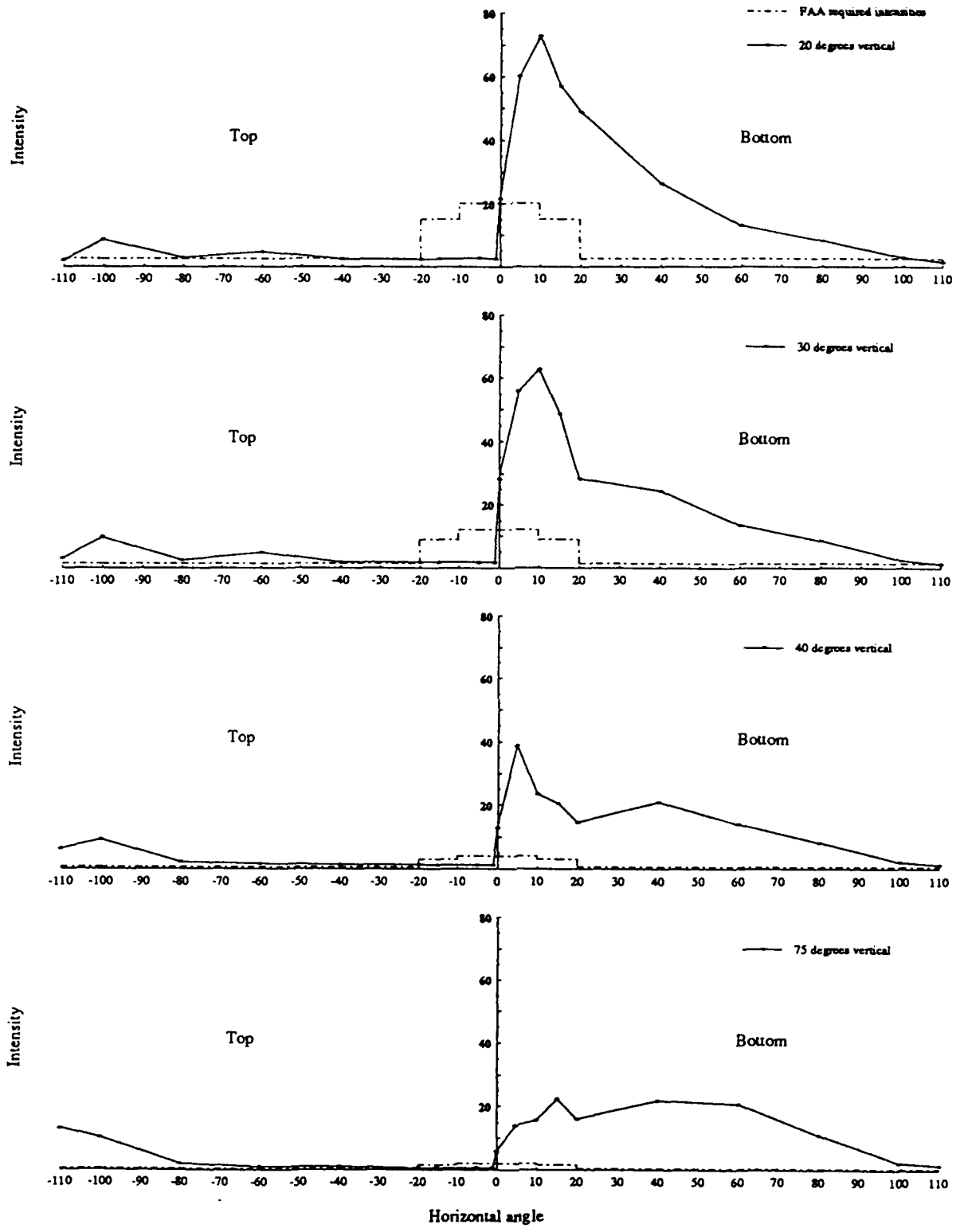

Figure E-2b. Intensity profiles for OH-58D/UH-60 green, half-masked lateral position light in bright mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

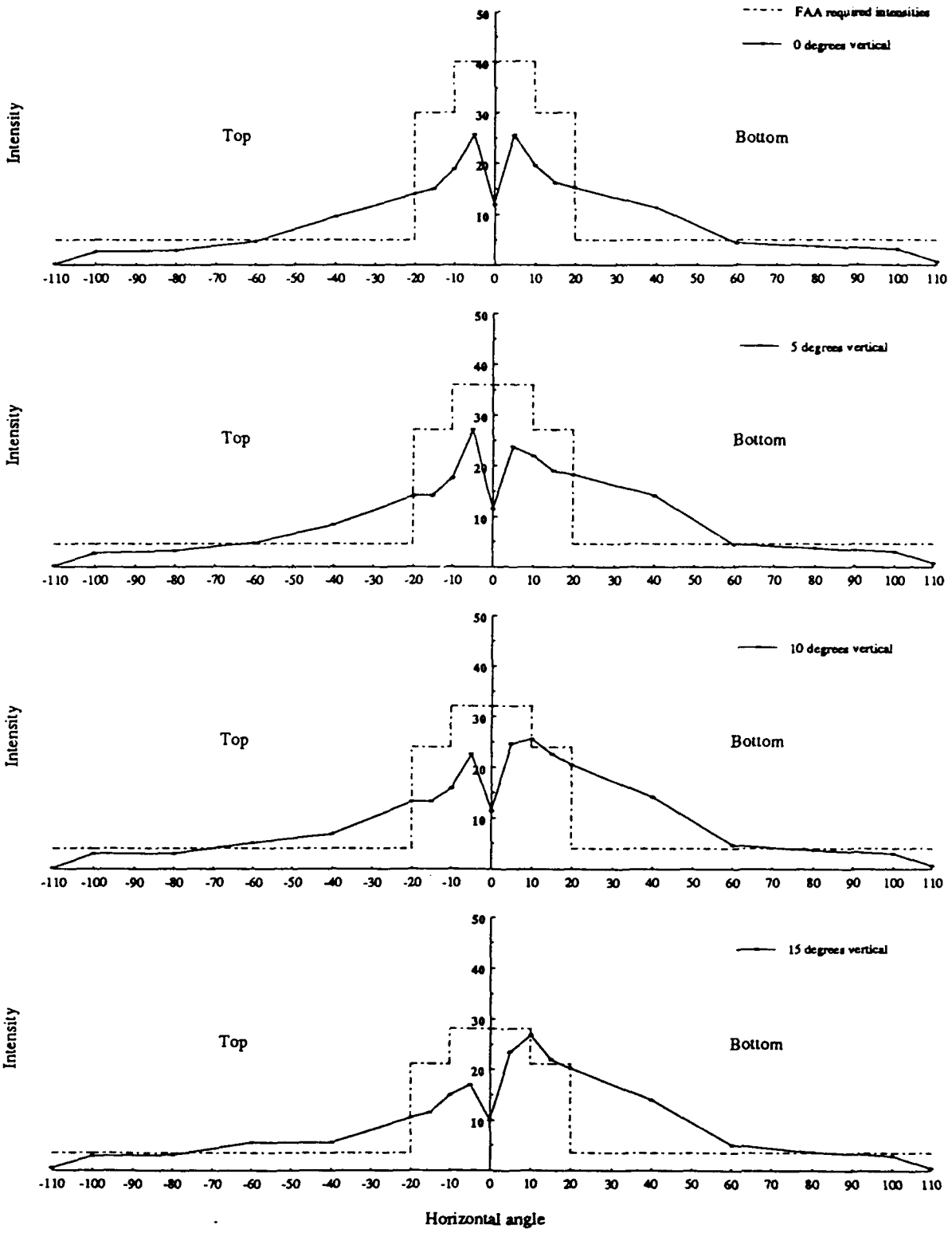

Figure E-3a. Intensity profiles for OH-58D/UH-60 green, unmasked lateral position light in dim mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

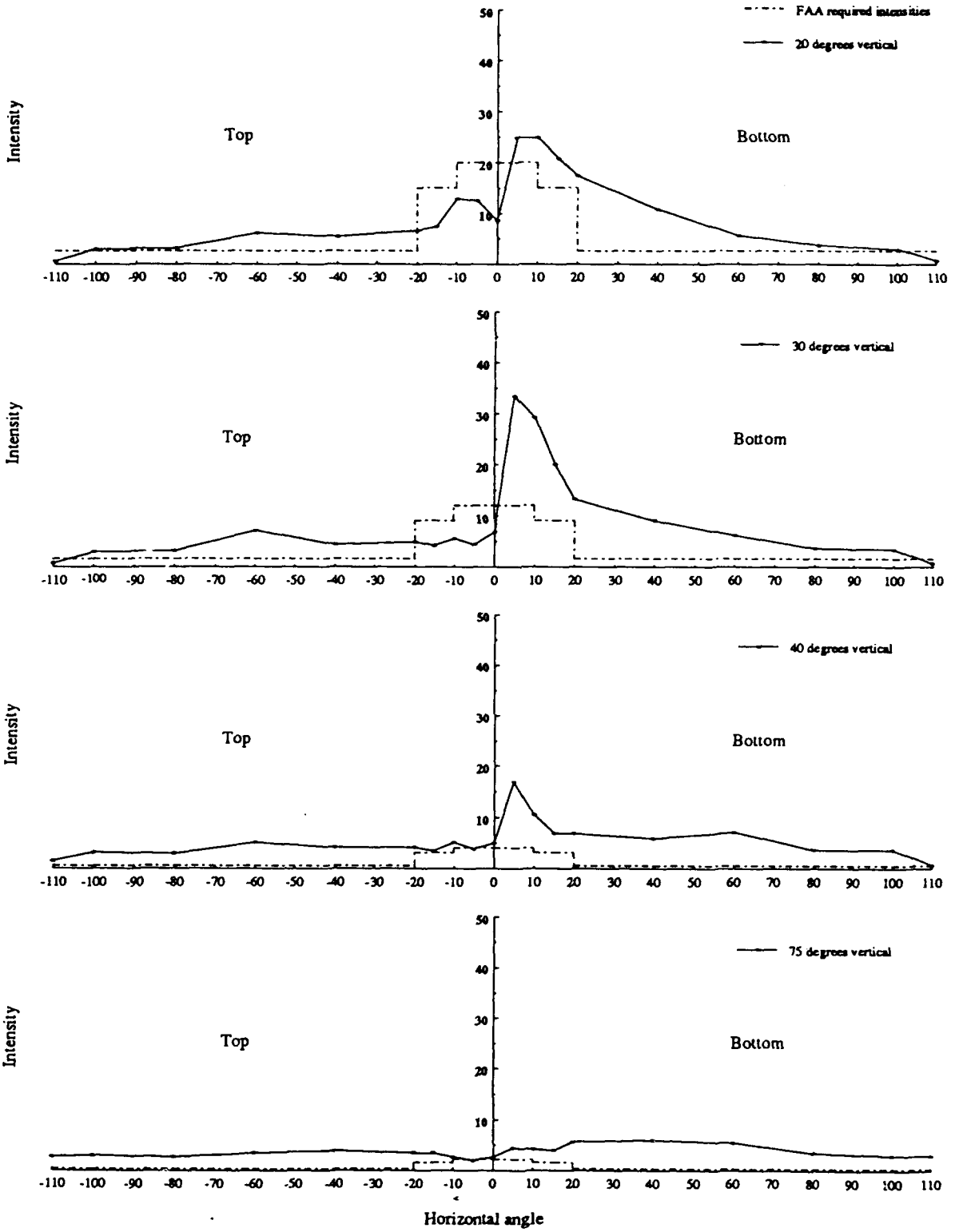

Figure E-3b. Intensity profiles for OH-58D/UH-60 green, unmasked lateral position light in dim mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

Table E-1a.

Measured data and calculated intensity values for OH-58D/UH-60 lateral position light, green dome configurations, single samples; unmasked and half-masked, bright. Intensity expressed in candelas.

UNMASKED/BRIGHT — Instrument readings — 30 Oct 1992

		CCW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	285	354	263	229	228	133	58	58	39	11
e	5	278	366	247	230	222	117	58	58	40	11
r	10	278	294	217	209	182	102	63	59	41	11
t	15	236	236	183	168	132	92	61	60	45	11
	20	141	208	137	109	95	83	68	59	50	11
TOP	30	60	86	75	75	76	68	69	58	60	13
	40	57	75	68	70	65	64	69	54	56	20
	75	28	42	46	59	52	57	57	51	45	50
	90										

d=15.6354' — candle power values — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	69.67	86.54	64.29	55.98	55.74	32.51	14.18	14.18	9.53	2.69
e	5	67.96	89.47	60.38	56.23	54.27	28.60	14.18	14.18	9.78	2.69
r	10	67.96	71.87	53.05	51.09	44.49	24.94	15.40	14.42	10.02	2.69
t	15	57.69	57.69	44.74	41.07	32.27	22.49	14.91	14.67	11.00	2.69
	20	34.47	50.85	33.49	26.65	23.22	20.29	16.62	14.42	12.22	2.69
TOP	30	14.67	21.02	18.33	18.33	18.58	16.62	16.87	14.18	14.67	3.18
	40	13.93	18.33	16.62	17.11	15.89	15.65	16.87	13.20	13.69	4.89
	75	6.85	10.27	11.25	14.42	12.71	13.93	13.93	12.47	11.00	12.22
	90										

HALF MASKED/BRIGHT — Instrument readings — 5 Nov. 1992

		CCW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	19	20	24	19	18	40	14	19	15	7
e	5	13	13	15	14	13	36	14	18	19	7
r	10	14	15	15	12	11	31	17	17	23	6
t	15	11	12	12	10	10	15	19	15	30	7
	20	11	11	10	10	9	10	19	12	35	8
TOP	30	7	7	7	7	7	7	20	10	40	13
	40	5	5	5	5	6	6	7	9	38	26
	75	2	3	3	3	3	4	4	8	42	54
	90										

d= 15.625' — candle power values — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	4.64	4.88	5.86	4.64	4.39	9.77	3.42	4.64	3.66	1.71
e	5	3.17	3.17	3.66	3.42	3.17	8.79	3.42	4.39	4.64	1.71
r	10	3.42	3.66	3.66	2.93	2.69	7.57	4.15	4.15	5.62	1.46
t	15	2.69	2.93	2.93	2.44	2.44	3.66	4.64	3.66	7.32	1.71
	20	2.69	2.69	2.44	2.44	2.20	2.44	4.64	2.93	8.54	1.95
TOP	30	1.71	1.71	1.71	1.71	1.71	1.71	4.88	2.44	9.77	3.17
	40	1.22	1.22	1.22	1.22	1.46	1.46	1.71	2.20	9.28	6.35
	75	0.49	0.73	0.73	0.73	0.73	0.98	0.98	1.95	10.25	13.18
	90										

Instrument readings — 2 Nov. 1992

		CW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	193	398	276	234	215	155	64	47	44	9
e	5	190	353	303	263	251	186	58	48	41	8
r	10	204	365	352	323	283	194	57	48	42	7
t	15	186	348	391	334	289	196	67	48	43	7
	20	179	344	368	294	253	167	70	50	44	7
BTM	30	179	490	369	295	212	127	78	55	49	7
	40	101	274	132	98	88	87	90	57	48	8
	75	52	58	52	56	73	83	77	46	40	48
	90										

d=15.6354' — candle power values — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	47.18	97.30	67.47	57.20	52.56	37.89	15.65	11.49	10.76	2.20
e	5	46.45	86.30	74.07	64.29	61.36	45.47	14.18	11.73	10.02	1.96
r	10	49.87	89.23	86.05	78.96	69.18	47.43	13.93	11.73	10.27	1.71
t	15	45.47	85.07	95.59	81.65	70.65	47.92	16.38	11.73	10.51	1.71
	20	43.76	84.10	89.96	71.87	61.85	40.83	17.11	12.22	10.76	1.71
BTM	30	43.76	119.79	90.21	72.12	51.83	31.05	19.07	13.45	11.98	1.71
	40	24.69	66.98	32.27	23.96	21.51	21.27	22.00	13.93	11.73	1.96
	75	12.71	14.18	12.71	13.69	17.85	20.29	18.82	11.25	9.78	11.73
	90										

Instrument readings — 6 Nov. 1992

		CW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	52	59	67	56	48	57	24	27	21	9
e	5	148	144	180	144	127	78	35	29	16	8
r	10	225	235	291	267	233	98	47	32	15	7
t	15	182	237	310	297	256	105	51	32	12	7
	20	166	246	297	233	200	108	53	34	12	6
BTM	30	224	228	257	199	116	100	55	35	10	6
	40	101	158	96	84	60	86	57	34	9	6
	75	46	57	64	91	66	90	85	45	9	6
	90										

d=15.6354' — candle power values — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	12.71	14.42	16.38	13.69	11.73	13.93	5.87	6.60	5.13	2.20
e	5	36.18	35.20	44.00	35.20	31.05	19.07	8.56	7.09	3.91	1.96
r	10	55.00	57.45	71.14	65.27	56.96	23.96	11.49	7.82	3.67	1.71
t	15	44.49	57.94	75.78	72.61	62.58	25.67	12.47	7.82	2.93	1.71
	20	40.58	60.14	72.61	56.96	48.89	26.40	12.96	8.31	2.93	1.47
BTM	30	54.76	55.74	62.83	48.65	28.36	24.45	13.45	8.56	2.44	1.47
	40	24.69	38.63	23.47	20.54	14.67	21.02	13.93	8.31	2.20	1.47
	75	11.25	13.93	15.65	22.25	16.13	22.00	20.78	11.00	2.20	1.47
	90										

Table E-1b.

Measured data and calculated intensity values for OH-58D/UH-60 lateral position light, green dome configurations, single samples; unmasked, dim. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 24 Nov. 1992

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	47	105	77	61	57	39	19	12	11	1
e	5	45	111	72	58	58	34	19	13	11	1
r	10	42	93	65	54	54	28	21	12	12	1
t	15	38	69	61	47	43	23	23	13	12	2
	20	27	51	53	30	27	22	25	13	12	2
TOP	30	15	18	23	17	20	18	29	13	12	3
	40	14	16	21	14	17	17	21	12	13	6
	75	6	8	11	14	14	16	14	11	12	11
	90										

candle power values

d=15.625' — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	11.47	25.63	18.80	14.89	13.92	9.52	4.64	2.93	2.69	0.24
e	5	10.99	27.10	17.58	14.16	14.16	8.30	4.64	3.17	2.69	0.24
r	10	10.25	22.71	15.87	13.18	13.18	6.84	5.13	2.93	2.93	0.24
t	15	9.28	16.85	14.89	11.47	10.50	5.62	5.62	3.17	2.93	0.49
	20	6.59	12.45	12.94	7.32	6.59	5.37	6.10	3.17	2.93	0.49
TOP	30	3.66	4.39	5.62	4.15	4.88	4.39	7.08	3.17	2.93	0.73
	40	3.42	3.91	5.13	3.42	4.15	4.15	5.13	2.93	3.17	1.46
	75	1.46	1.95	2.69	3.42	3.42	3.91	3.42	2.69	2.93	2.69
	90										

Instrument readings — 25 Nov. 1992

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	50	104	80	66	62	46	18	15	13	3
e	5	49	97	90	78	75	58	18	15	12	3
r	10	51	101	105	93	84	58	19	15	12	3
t	15	44	96	110	90	83	57	21	15	12	2
	20	43	102	102	85	71	44	23	15	12	3
BTM	30	42	137	120	82	54	37	25	15	14	3
	40	27	69	43	28	28	24	29	15	15	3
	75	16	18	17	16	23	24	22	14	12	12
	90										

candle power values

d=15.625' — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	12.21	25.39	19.53	16.11	15.14	11.23	4.39	3.66	3.17	0.73
e	5	11.96	23.68	21.97	19.04	18.31	14.16	4.39	3.66	2.93	0.73
r	10	12.45	24.66	25.63	22.71	20.51	14.16	4.64	3.66	2.93	0.73
t	15	10.74	23.44	26.86	21.97	20.26	13.92	5.13	3.66	2.93	0.49
	20	10.50	24.90	24.90	20.75	17.33	10.74	5.62	3.66	2.93	0.73
BTM	30	10.25	33.45	29.30	20.02	13.18	9.03	6.10	3.66	3.42	0.73
	40	6.59	16.85	10.50	6.84	6.84	5.86	7.08	3.66	3.66	0.73
	75	3.91	4.39	4.15	3.91	5.62	5.86	5.37	3.42	2.93	2.93
	90										

Appendix F.

Intensity profiles, illuminance measurements, and calculated intensities for UH-1/OH-58A or C/AH-1 left (red) lateral position light.

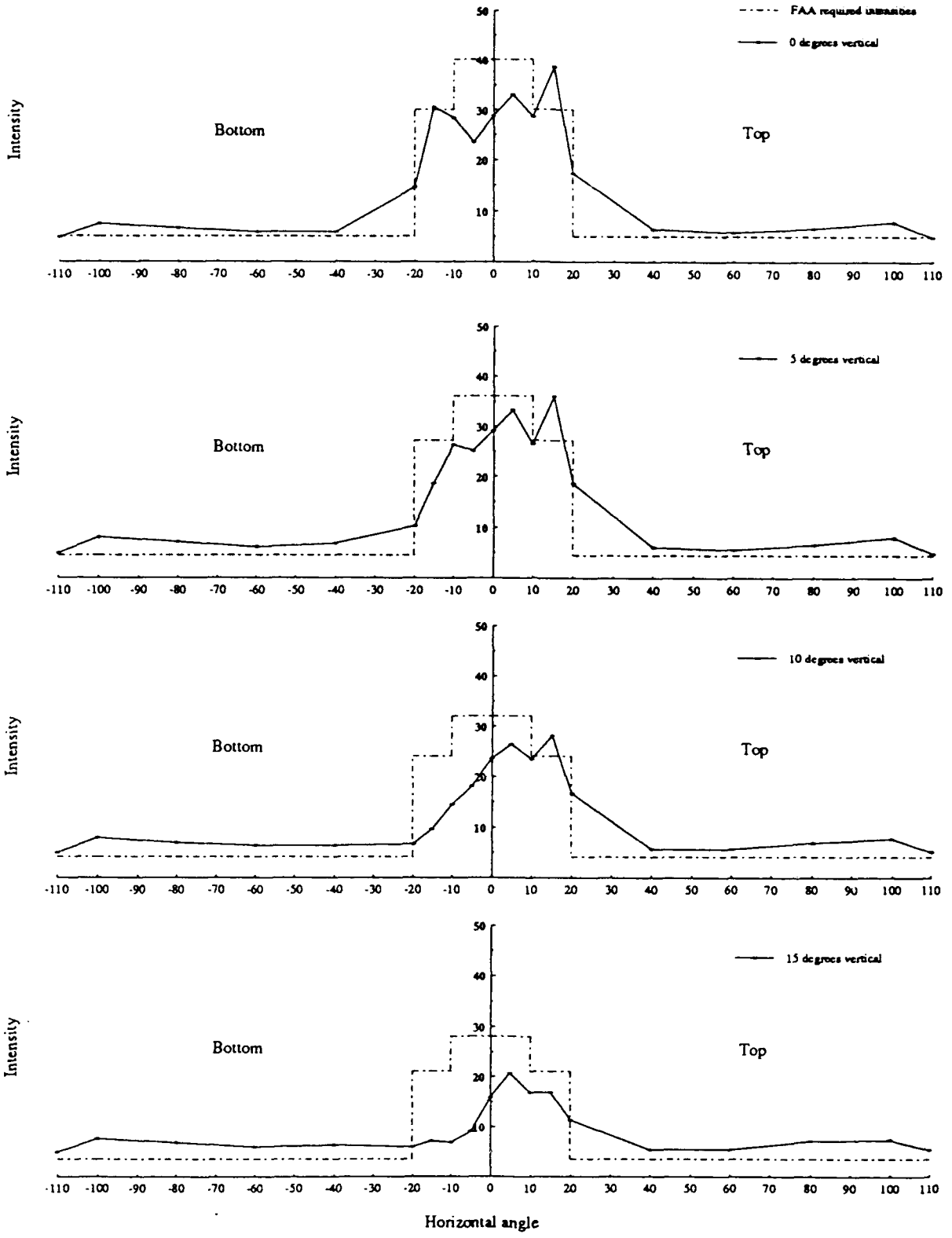

Figure F-1a. Intensity profiles for UH-1/OH-58A or C/AH-1 red, unmasked lateral position light in bright mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

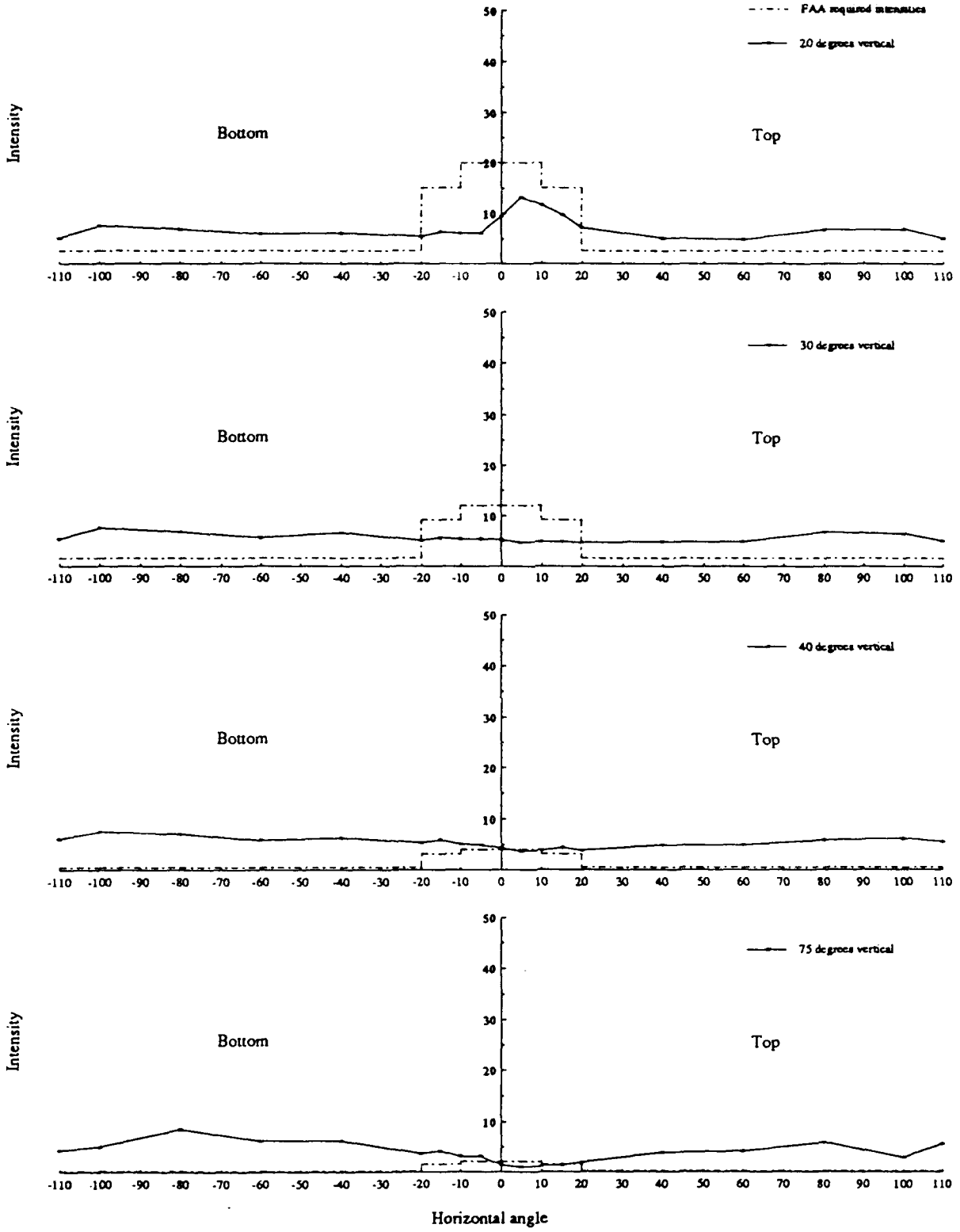

Figure F-1b. Intensity profiles for UH-1/OH-58A or C/AH-1 red, unmasked lateral position light in bright mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

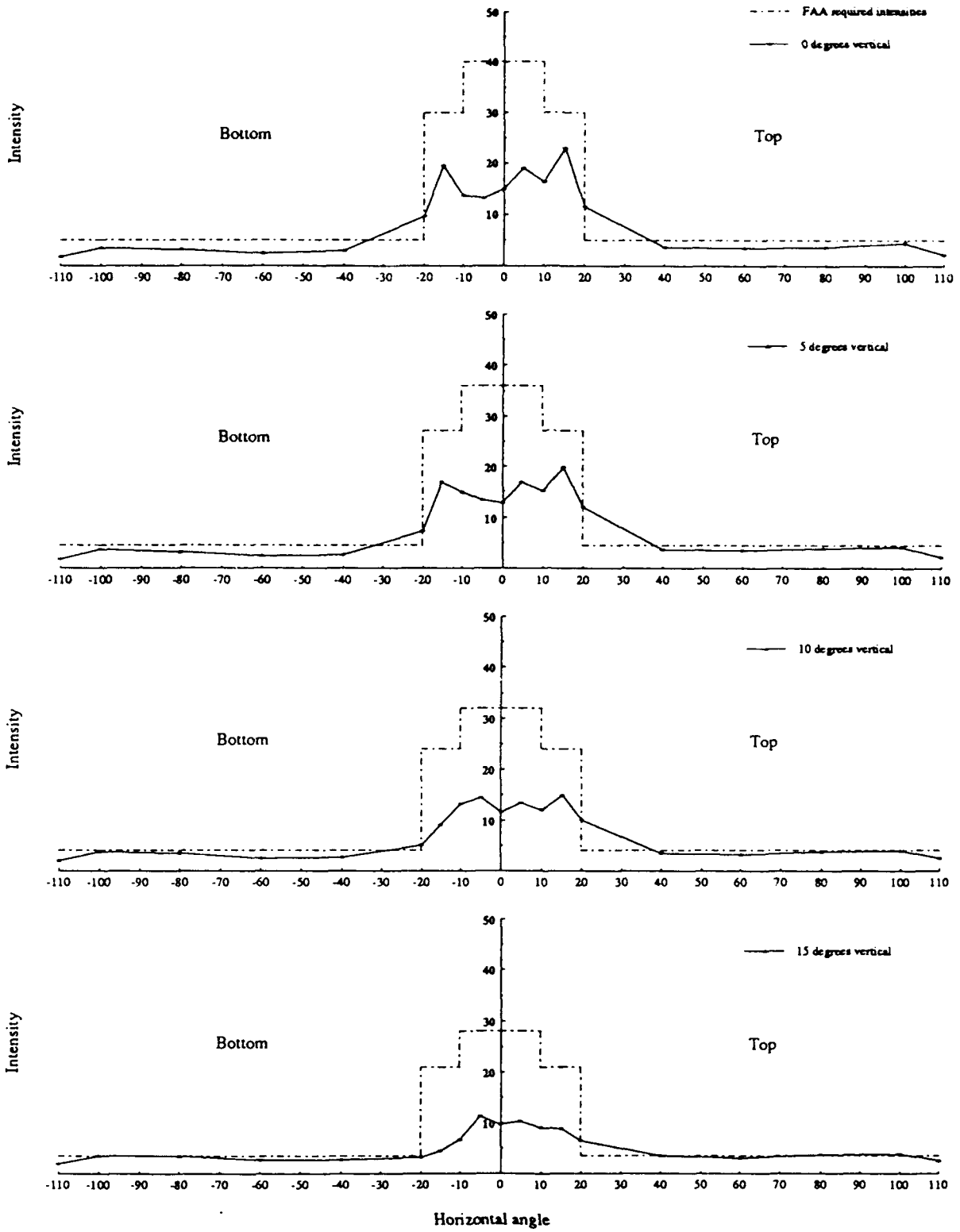

Figure F-2a. Intensity profiles for UH-1/OH-58A or C/AH-1 red, unmasked lateral position light in dim mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

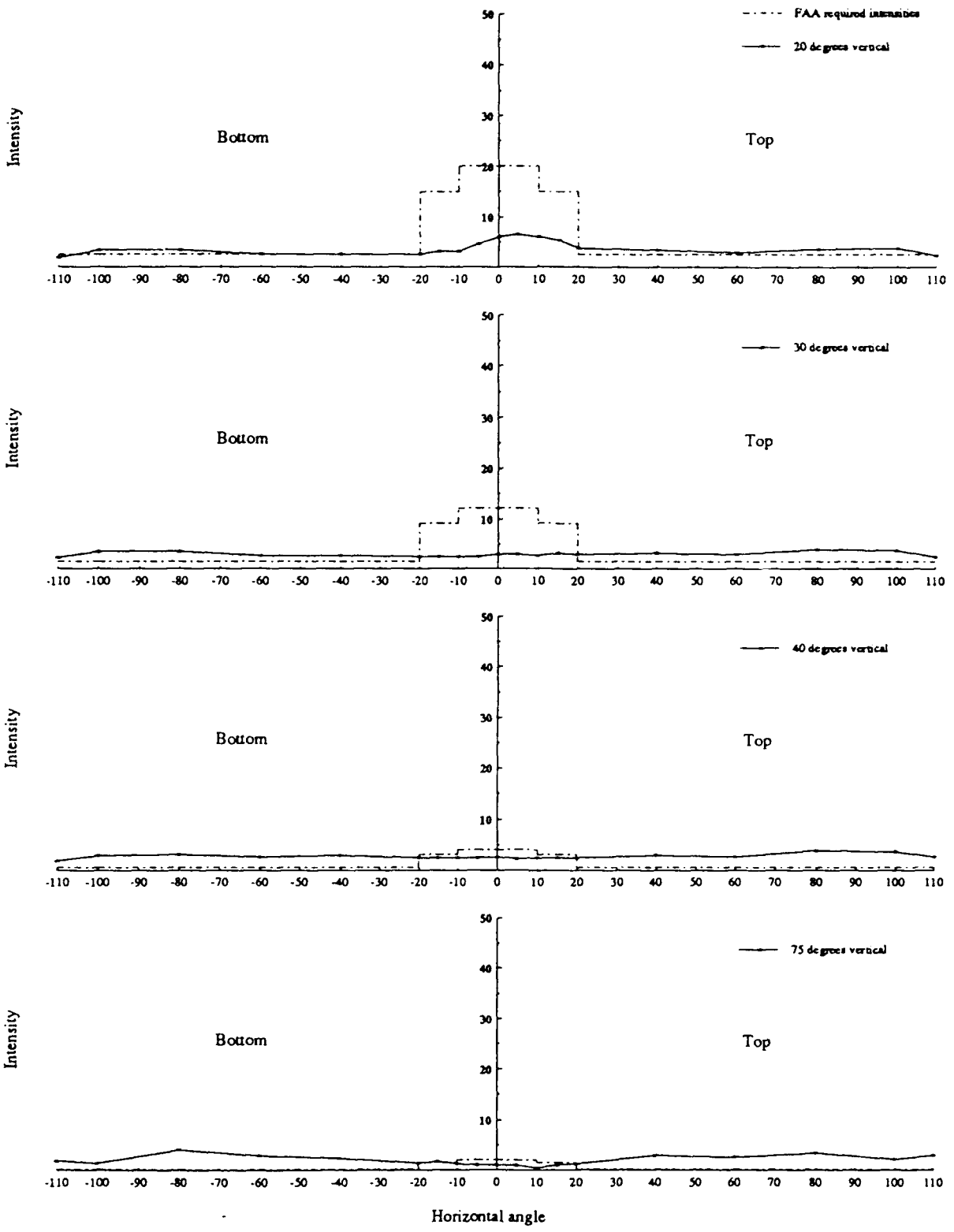

Figure F-2b. Intensity profiles for UH-1/OH-58A or C/AH-1 red, unmasked lateral position light in dim mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

Table F-1.

Measured data and calculated intensity values for UH-1/OH-58A or C/AH-1 lateral position light, red dome configurations, single samples; unmasked, bright and dim. Intensity expressed in candelas.

UNMASKED/BRIGHT — instrument readings — 13 Nov. 1992

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	140	135	117	157	71	26	24	27	32	20
e	5	135	136	108	147	76	25	23	27	33	20
r	10	105	108	96	115	68	23	23	28	31	21
t	15	76	85	69	69	46	22	22	29	30	22
	20	51	54	48	40	29	21	20	28	28	21
TOP	30	21	19	20	20	19	20	20	28	26	21
	40	15	15	16	18	16	20	20	24	25	23
	75	3	4	5	6	8	16	17	24	12	23
	90										

candle power values — d=15.6354'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	34.23	33.00	28.60	38.38	17.36	6.36	5.87	6.60	7.82	4.89
e	5	33.00	33.25	26.40	35.94	18.58	6.11	5.62	6.60	8.07	4.89
r	10	25.67	26.40	23.47	28.11	16.62	5.62	5.62	6.85	7.58	5.13
t	15	18.58	20.78	16.87	16.87	11.25	5.38	5.38	7.09	7.33	5.38
	20	12.47	13.20	11.73	9.78	7.09	5.13	4.89	6.85	6.85	5.13
TOP	30	5.13	4.64	4.89	4.89	4.64	4.89	4.89	6.85	6.36	5.13
	40	3.67	3.67	3.91	4.40	3.91	4.89	4.89	5.87	6.11	5.62
	75	0.73	0.98	1.22	1.47	1.96	3.91	4.16	5.87	2.93	5.62
	90										

UNMASKED/DIM — instrument readings — 30 Nov. 1992

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	71	78	67	94	47	15	14	15	18	9
e	5	61	69	62	81	49	15	14	16	17	9
r	10	48	55	49	61	41	14	13	15	16	10
t	15	35	42	37	36	26	14	12	15	16	10
	20	23	27	25	22	16	14	12	15	16	10
TOP	30	13	12	11	13	12	13	12	16	15	10
	40	10	9	10	10	10	12	11	16	15	11
	75	3	4	2	4	5	12	11	14	9	12
	90										

candle power values — d=15.6354'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	17.36	19.07	16.38	22.98	11.49	3.67	3.42	3.67	4.40	2.20
e	5	14.91	16.87	15.16	19.80	11.98	3.67	3.42	3.91	4.16	2.20
r	10	11.73	13.45	11.98	14.91	10.02	3.42	3.18	3.67	3.91	2.44
t	15	8.56	10.27	9.05	8.80	6.36	3.42	2.93	3.67	3.91	2.44
	20	5.62	6.60	6.11	5.38	3.91	3.42	2.93	3.67	3.91	2.44
TOP	30	3.18	2.93	2.69	3.18	2.93	3.18	2.93	3.91	3.67	2.44
	40	2.44	2.20	2.44	2.44	2.44	2.93	2.69	3.91	3.67	2.69
	75	0.73	0.98	0.49	0.98	1.22	2.93	2.69	3.42	2.20	2.93
	90										

instrument readings — 16 Nov. 1992

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	95	96	116	125	60	24	24	27	31	20
e	5	103	103	108	76	42	28	25	29	33	20
r	10	88	74	59	39	27	26	26	28	32	20
t	15	54	37	28	29	24	26	24	28	31	20
	20	26	25	25	26	22	25	24	28	31	21
BTM	30	22	22	22	23	21	27	23	28	31	22
	40	21	20	21	24	22	26	24	29	31	25
	75	9	13	13	17	15	26	26	35	21	18
	90										

candle power values — d= 15.625'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	23.19	23.44	28.32	30.52	14.65	5.86	5.86	6.59	7.57	4.88
e	5	25.15	25.15	26.37	18.55	10.25	6.84	6.10	7.08	8.06	4.88
r	10	21.48	18.07	14.40	9.52	6.59	6.35	6.35	6.84	7.81	4.88
t	15	13.18	9.03	6.84	7.08	5.86	6.35	5.86	6.84	7.57	4.88
	20	6.35	6.10	6.10	6.35	5.37	6.10	5.86	6.84	7.57	5.13
BTM	30	5.37	5.37	5.37	5.62	5.13	6.59	5.62	6.84	7.57	5.37
	40	5.13	4.88	5.13	5.86	5.37	6.35	5.86	7.08	7.57	6.10
	75	2.20	3.17	3.17	4.15	3.66	6.35	6.35	8.54	5.13	4.39
	90										

instrument readings — 2 Dec. 1992

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	51	54	56	80	39	12	10	13	14	7
e	5	45	55	61	69	30	11	10	13	15	7
r	10	47	59	54	37	21	11	10	14	15	8
t	15	44	46	27	18	13	11	11	14	14	8
	20	27	19	13	13	11	11	11	14	14	8
BTM	30	11	10	10	10	10	11	11	14	14	9
	40	11	10	10	10	10	12	11	13	12	8
	75	5	4	5	7	6	10	12	17	6	8
	90										

candle power values — d= 15.625'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	12.45	13.18	13.67	19.53	9.52	2.93	2.44	3.17	3.42	1.71
e	5	10.99	13.43	14.89	16.85	7.32	2.69	2.44	3.17	3.66	1.71
r	10	11.47	14.40	13.18	9.03	5.13	2.69	2.44	3.42	3.66	1.95
t	15	10.74	11.23	6.59	4.39	3.17	2.69	2.69	3.42	3.42	1.95
	20	6.59	4.64	3.17	3.17	2.69	2.69	2.69	3.42	3.42	1.95
BTM	30	2.69	2.44	2.44	2.44	2.44	2.69	2.69	3.42	3.42	2.20
	40	2.69	2.44	2.44	2.44	2.44	2.93	2.69	3.17	2.93	1.95
	75	1.22	0.98	1.22	1.71	1.46	2.44	2.93	4.15	1.46	1.95
	90										

Appendix G.

Intensity profiles, illuminance measurements, and calculated intensities for UH-1/OH-58A or C/AH-1 right (green) lateral position light.

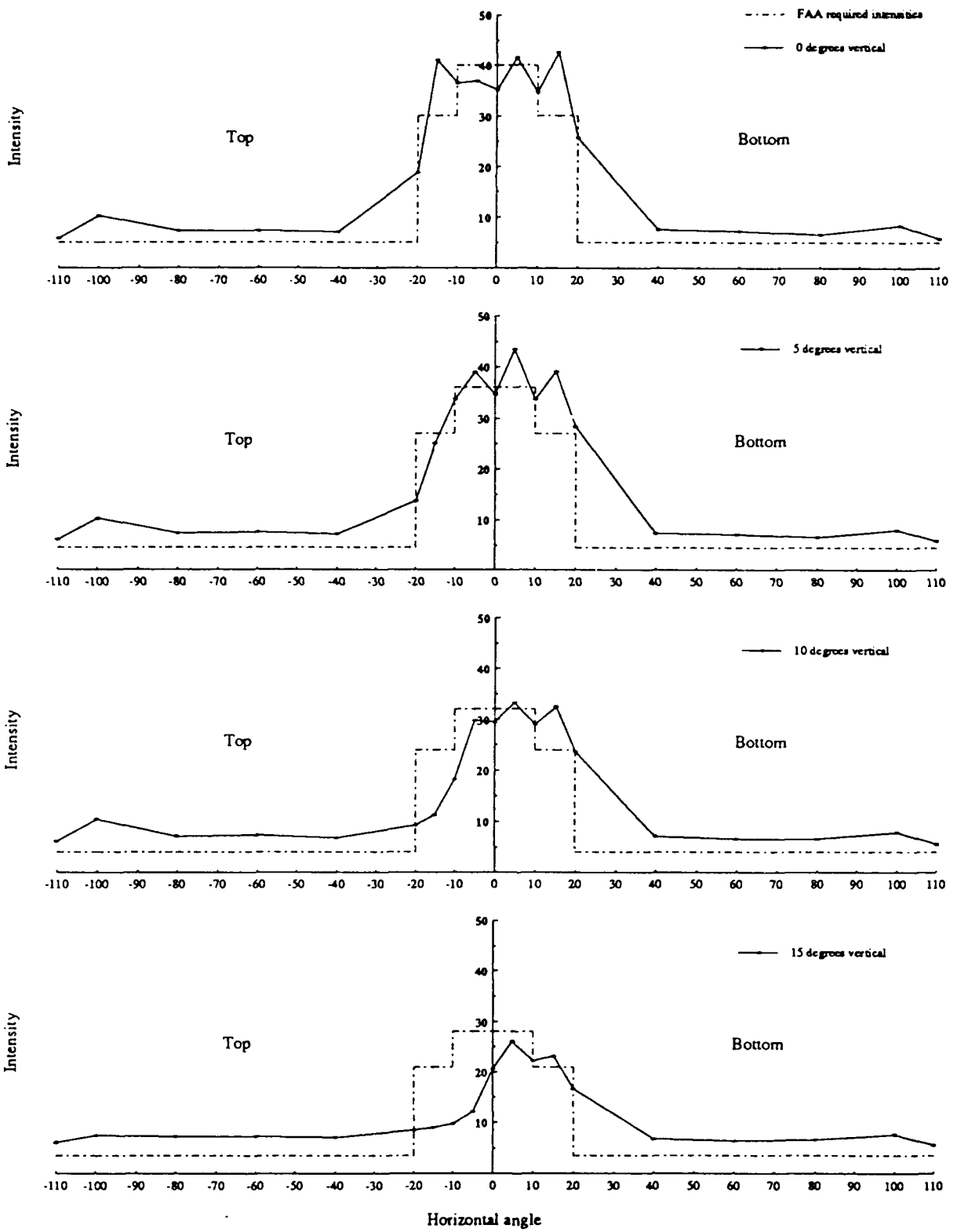

Figure G-1a. Intensity profiles for UH-1/OH-58A or C/AH-1 green, unmasked lateral position light in bright mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

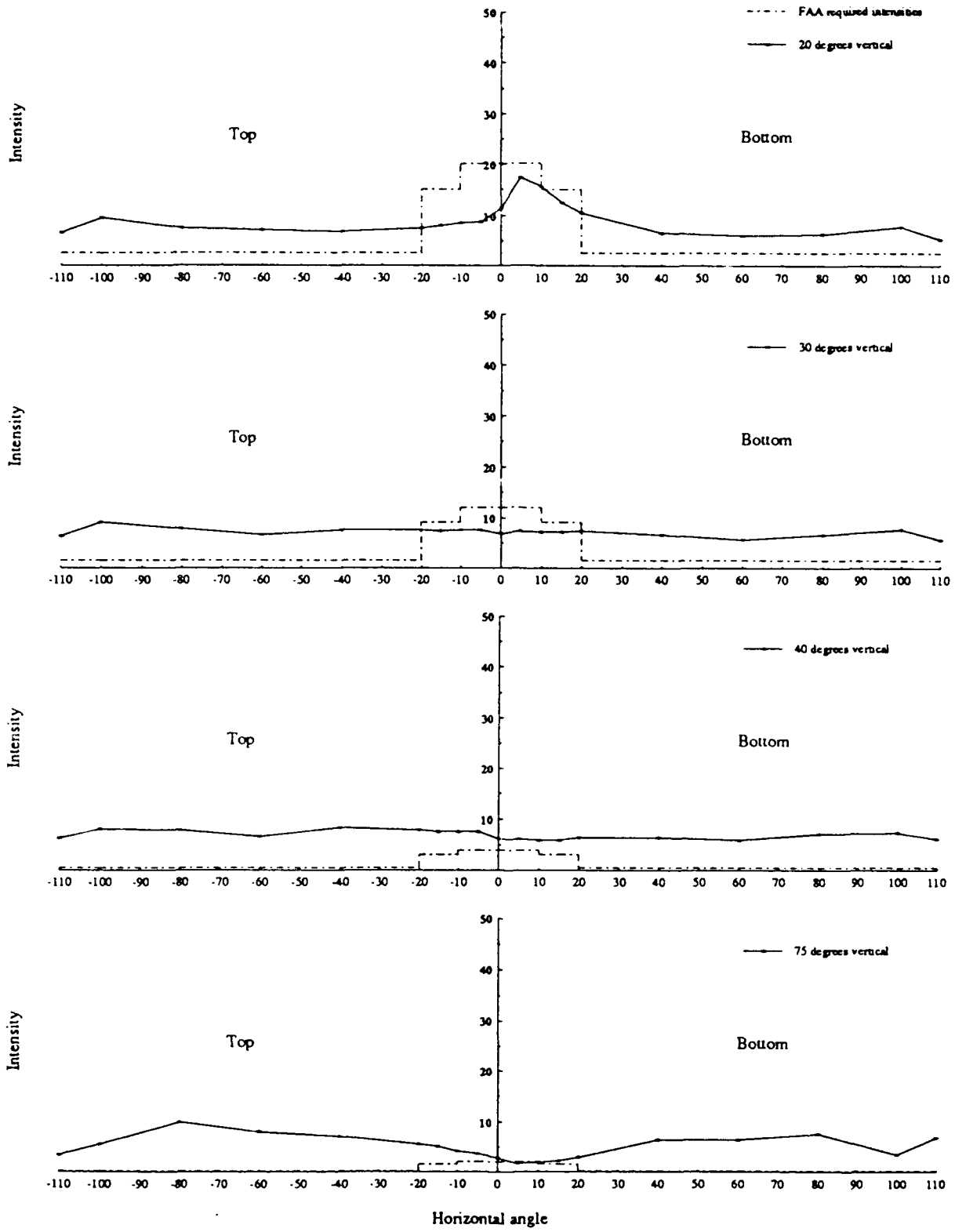

Figure G-1b. Intensity profiles for UH-1/OH-58A or C/AH-1 green, unmasked lateral position light in bright mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

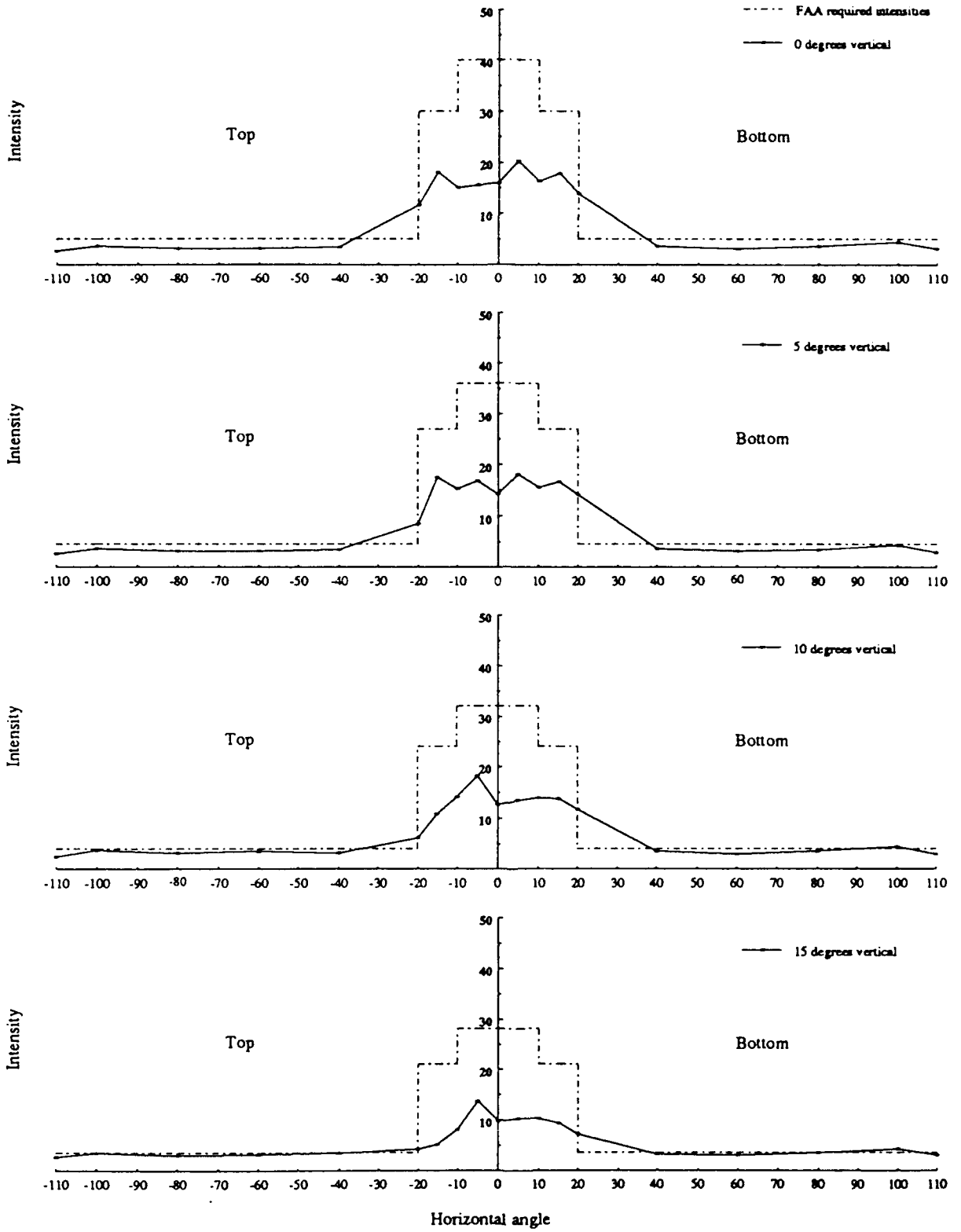

Figure G-2a. Intensity profiles for UH-1/OH-58A or C/AH-1 green, unmasked lateral position light in dim mode; vertical angles 0 to 15 degrees. Intensity expressed in candelas.

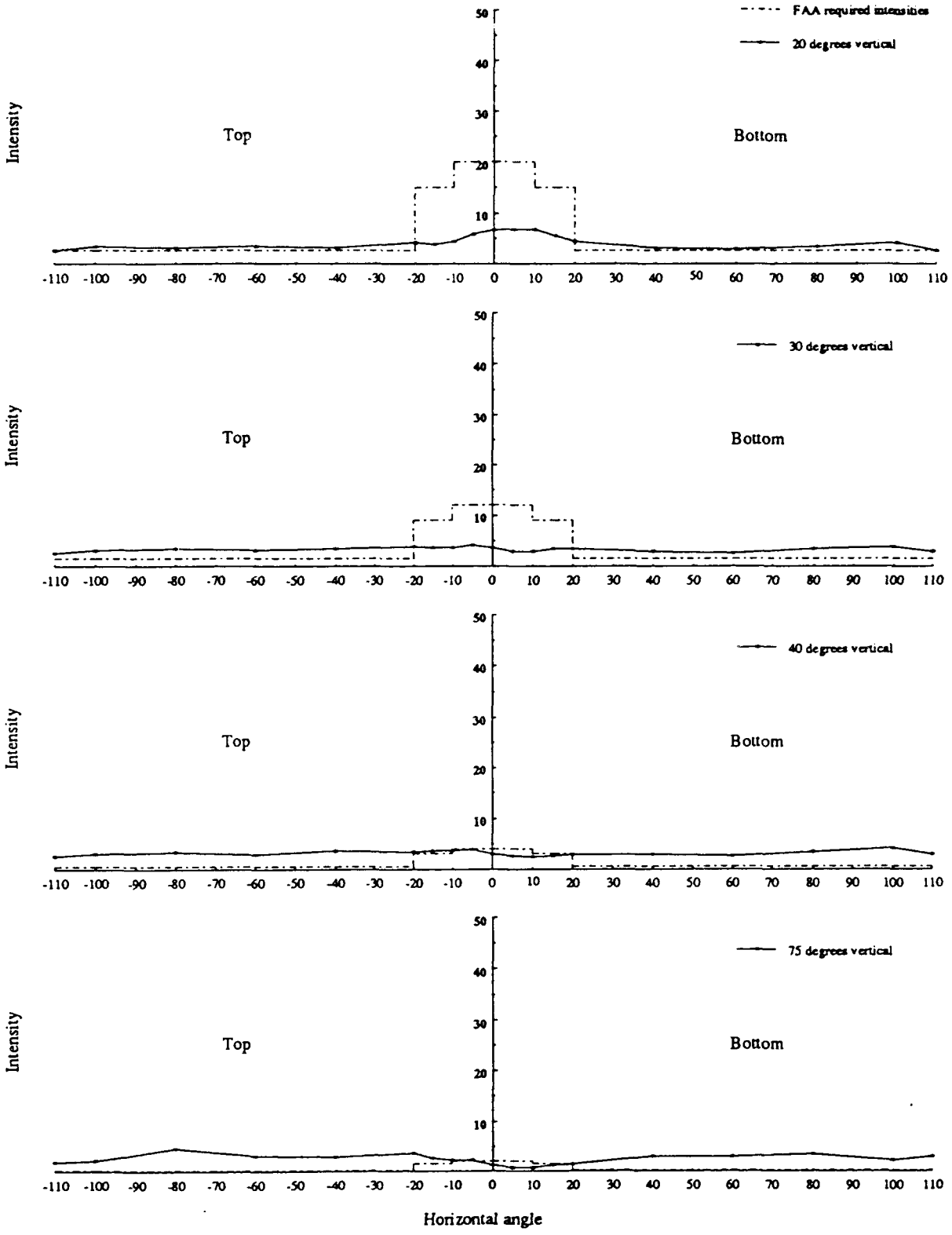

Figure G-2b. Intensity profiles for UH-1/OH-58A or C/AH-1 green, unmasked lateral position light in dim mode; vertical angles 20 to 75 degrees. Intensity expressed in candelas.

Table G-1.

Measured data and calculated intensity values for UH-1/OH-58A or C/AH-1 lateral position light, green dome configurations, single samples; unmasked, bright and dim. Intensity expressed in candelas.

UNMASKED/BRIGHT — Instrument readings — 16 Nov. 1992

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	131	151	150	168	77	29	30	30	42	24
e	5	134	160	138	103	56	29	31	30	42	25
r	10	120	122	75	46	38	28	30	29	43	25
t	15	79	30	40	37	35	29	30	30	31	25
	20	35	36	35	33	31	28	29	31	39	27
TOP	30	29	31	31	30	31	31	27	32	37	26
	40	29	31	31	31	32	34	27	32	33	26
	75	15	15	17	21	23	29	33	41	23	14
	90										

d= 15.625' — candle power values — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	31.98	36.87	36.62	41.02	18.80	7.08	7.32	7.32	10.25	5.86
e	5	32.71	39.06	33.69	25.15	13.67	7.08	7.57	7.32	10.25	6.10
r	10	29.30	29.79	18.31	11.23	9.28	6.84	7.32	7.08	10.50	6.10
t	15	19.29	12.21	9.77	9.03	8.54	7.08	7.32	7.32	7.57	6.10
	20	8.54	8.79	8.54	8.06	7.57	6.84	7.08	7.57	9.52	6.59
TOP	30	7.08	7.57	7.57	7.32	7.57	7.57	6.59	7.81	9.03	6.35
	40	7.08	7.57	7.57	7.57	7.81	8.30	6.59	7.81	8.06	6.35
	75	3.66	3.66	4.15	5.13	5.62	7.08	8.06	10.01	5.62	3.42
	90										

UNMASKED/DIM — Instrument readings — 2 Dec. 1992

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	61	64	62	74	48	14	13	13	15	11
e	5	58	69	63	72	35	14	13	13	15	11
r	10	58	75	58	44	25	13	14	13	15	10
t	15	49	56	33	21	17	14	13	12	14	11
	20	33	24	18	16	17	13	14	13	14	11
TOP	30	16	17	15	15	16	14	13	14	13	11
	40	15	16	15	15	14	15	12	14	13	11
	75	8	9	9	11	15	12	13	19	9	8
	90										

d= 15.625' — candle power values — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	14.89	15.63	15.14	18.07	11.72	3.42	3.17	3.17	3.66	2.69
e	5	14.16	16.85	15.38	17.58	8.54	3.42	3.17	3.17	3.66	2.69
r	10	14.16	18.31	14.16	10.74	6.10	3.17	3.42	3.17	3.66	2.44
t	15	11.96	13.67	8.06	5.13	4.15	3.42	3.17	2.93	3.42	2.69
	20	8.06	5.86	4.39	3.91	4.15	3.17	3.42	3.17	3.42	2.69
TOP	30	3.91	4.15	3.66	3.66	3.91	3.42	3.17	3.42	3.17	2.69
	40	3.66	3.91	3.66	3.66	3.42	3.66	2.93	3.42	3.17	2.69
	75	1.95	2.20	2.20	2.69	3.66	2.93	3.17	4.64	2.20	1.95
	90										

Instrument readings — 13 Nov. 1992

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	157	170	142	174	105	31	30	27	34	24
e	5	150	178	138	160	116	30	29	27	33	24
r	10	121	136	119	133	97	29	27	27	32	23
t	15	90	107	91	95	68	28	26	27	31	23
	20	59	71	64	51	43	27	25	26	32	22
BTM	30	27	30	29	29	30	27	23	27	31	23
	40	21	25	24	24	26	26	24	29	30	25
	75	8	7	8	9	12	26	26	31	14	28
	90										

d= 15.6354' — candle power values — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	38.38	41.56	34.71	42.54	25.67	7.58	7.33	6.60	8.31	5.87
e	5	36.67	43.51	33.74	39.11	28.36	7.33	7.09	6.60	8.07	5.87
r	10	29.58	33.25	29.09	32.51	23.71	7.09	6.60	6.60	7.82	5.62
t	15	22.00	26.16	22.25	23.22	16.62	6.85	6.36	6.60	7.58	5.62
	20	14.42	17.36	15.65	12.47	10.51	6.60	6.11	6.36	7.82	5.38
BTM	30	6.60	7.33	7.09	7.09	7.33	6.60	5.62	6.60	7.58	5.62
	40	5.13	6.11	5.87	5.87	6.36	6.36	5.87	7.09	7.33	6.11
	75	1.96	1.71	1.96	2.20	2.93	6.36	6.36	7.58	3.42	6.85
	90										

Instrument readings — 1 Dec. 1992

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	70	83	67	73	57	15	13	15	18	13
e	5	59	74	64	68	58	15	13	14	18	12
r	10	45	55	57	56	48	14	12	14	18	12
t	15	31	42	42	38	29	13	12	14	17	12
	20	22	28	28	23	18	13	12	14	17	11
BTM	30	14	12	12	14	14	12	11	14	16	12
	40	10	11	10	11	12	12	11	14	17	12
	75	2	3	3	5	6	12	12	14	9	12
	90										

d= 15.6354' — candle power values — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	17.11	20.29	16.38	17.85	13.93	3.67	3.18	3.67	4.40	3.18
e	5	14.42	18.09	15.65	16.62	14.18	3.67	3.18	3.42	4.40	2.93
r	10	11.00	13.45	13.93	13.69	11.73	3.42	2.93	3.42	4.40	2.93
t	15	7.58	10.27	10.27	9.29	7.09	3.18	2.93	3.42	4.16	2.93
	20	5.38	6.85	6.85	5.62	4.40	3.18	2.93	3.42	4.16	2.69
BTM	30	3.42	2.93	2.93	3.42	3.42	2.93	2.69	3.42	3.91	2.93
	40	2.44	2.69	2.44	2.69	2.93	2.93	2.69	3.42	4.16	2.93
	75	0.49	0.73	0.73	1.22	1.47	2.93	2.93	3.42	2.20	2.93
	90										

Appendix H.

Intensity profiles, illuminance measurements, and calculated intensities for OH-58A, C, or D/AH-1 tail position light.

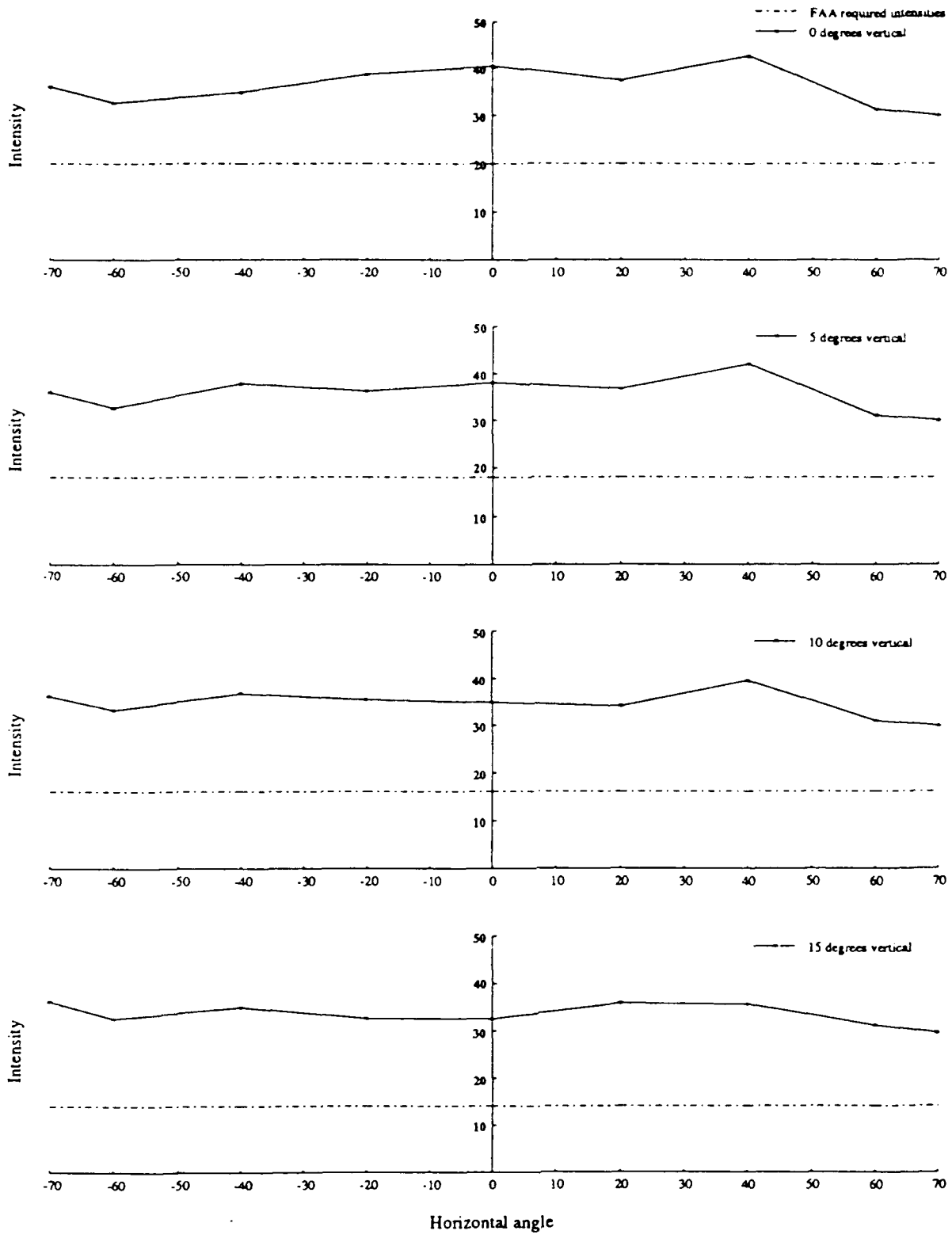

Figure H-1a. Intensity profiles for OH-58A, C, or D/AH-1 unmasked tail position light in bright mode; top, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

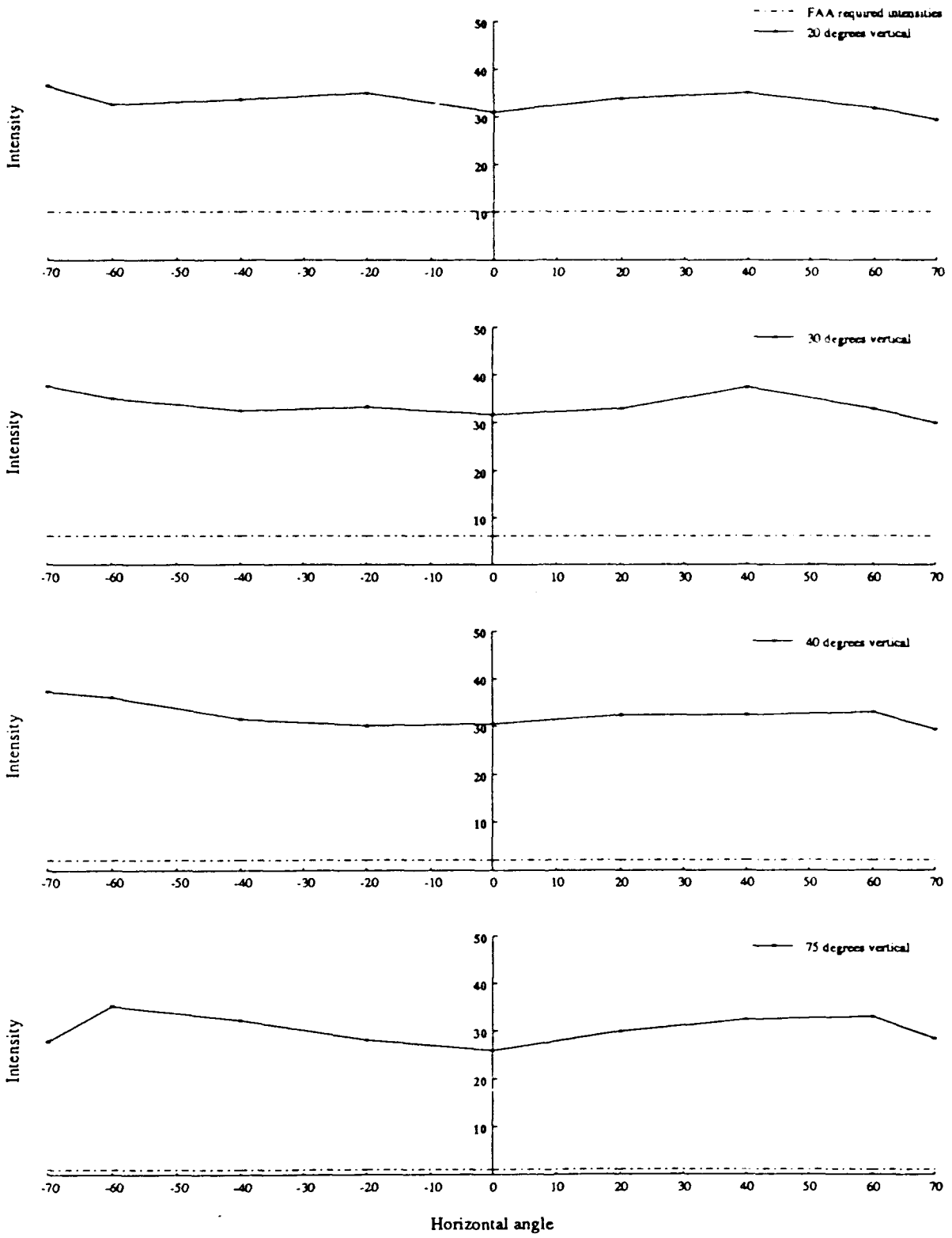

Figure H-1b. Intensity profiles for OH-58A, C, or D/AH-1 unmasked tail position light in bright mode; top, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

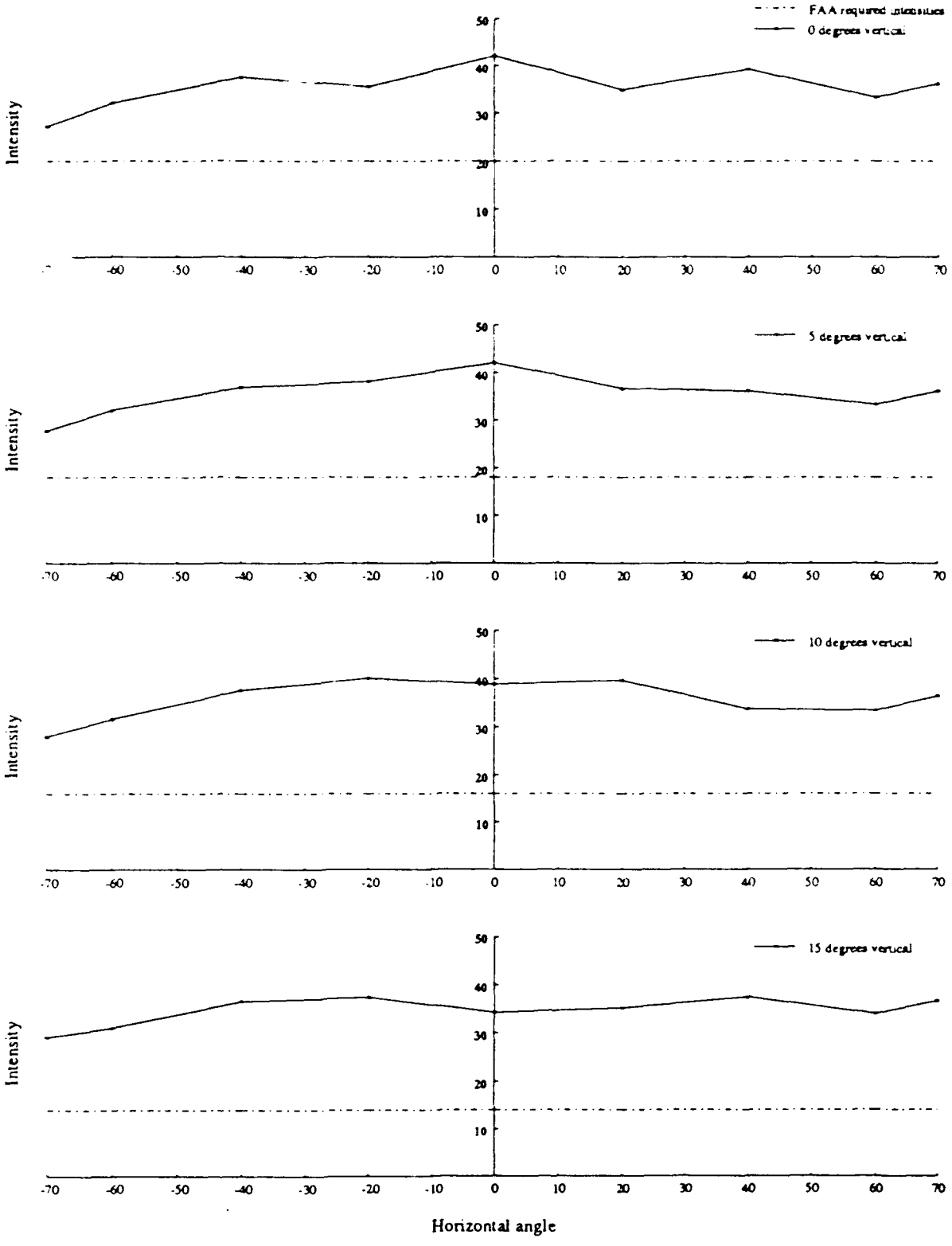

Figure H-1c. Intensity profiles for OH-58A, C, or D/AH-1 unmasked tail position light in bright mode; bottom, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

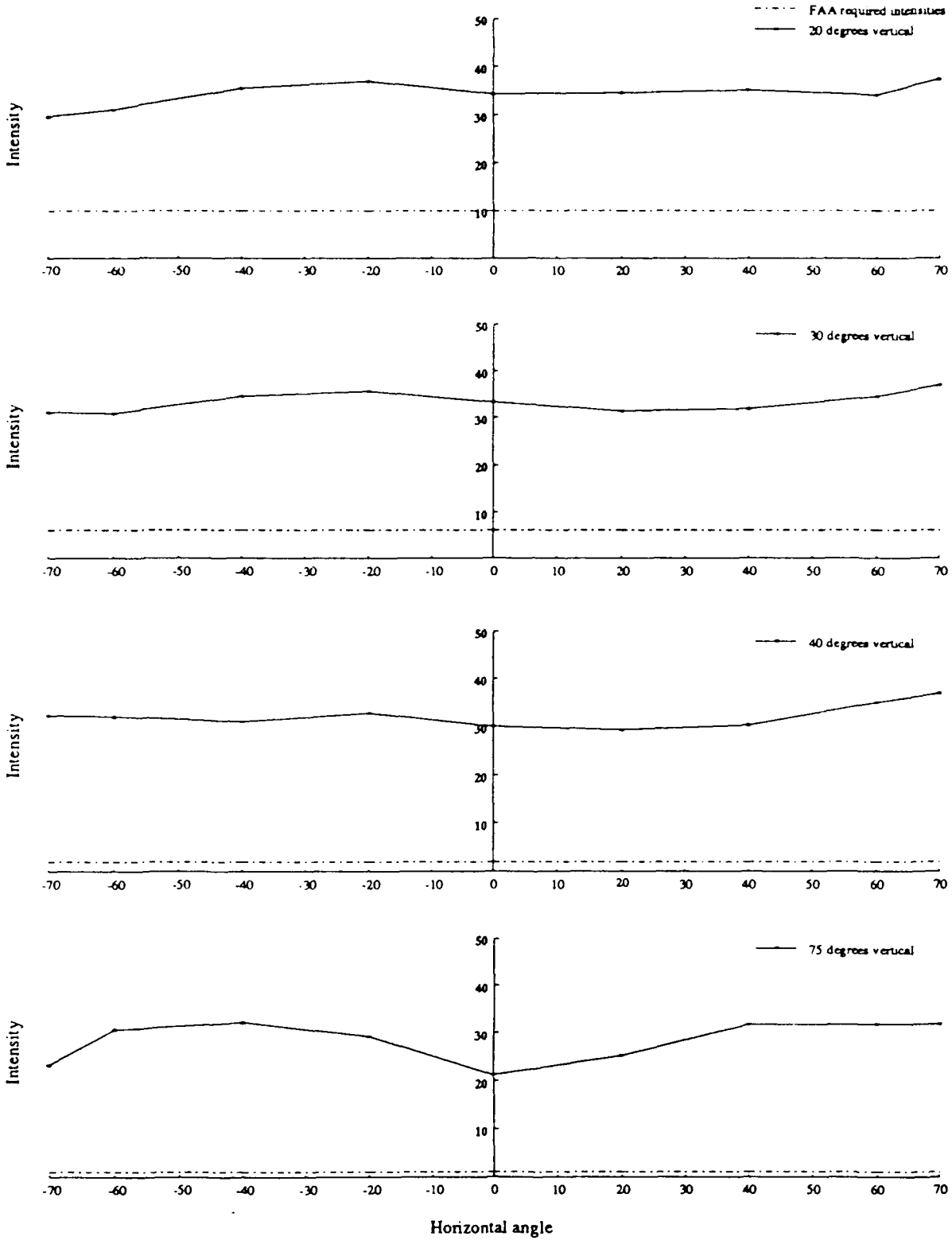

Figure H-1d. Intensity profiles for OH-58A, C, or D/AH-1 unmasked tail position light in bright mode; bottom, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

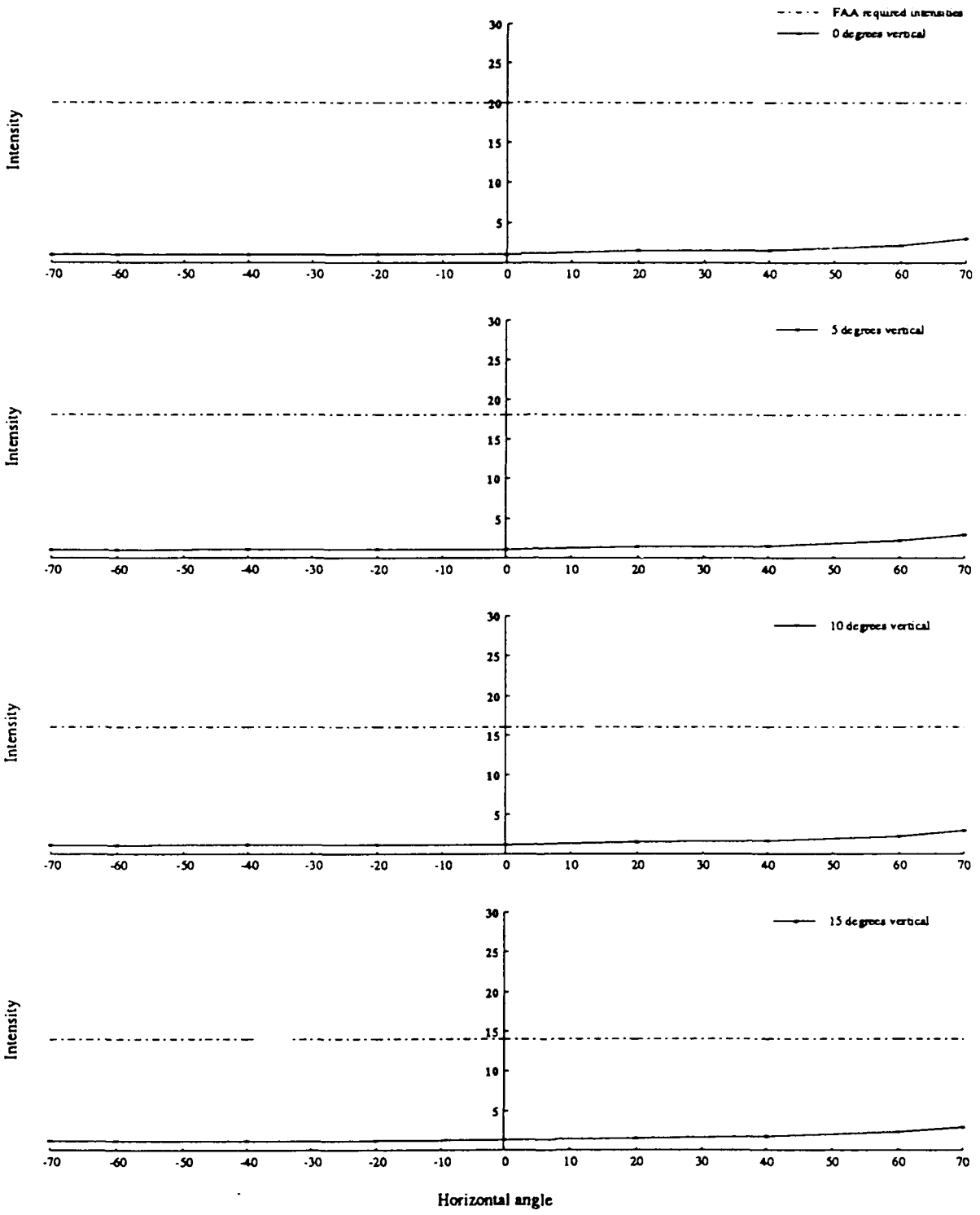

Figure H-2a. Intensity profiles for OH-58A, C, or D/AH-1 masked tail position light in bright mode; top, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

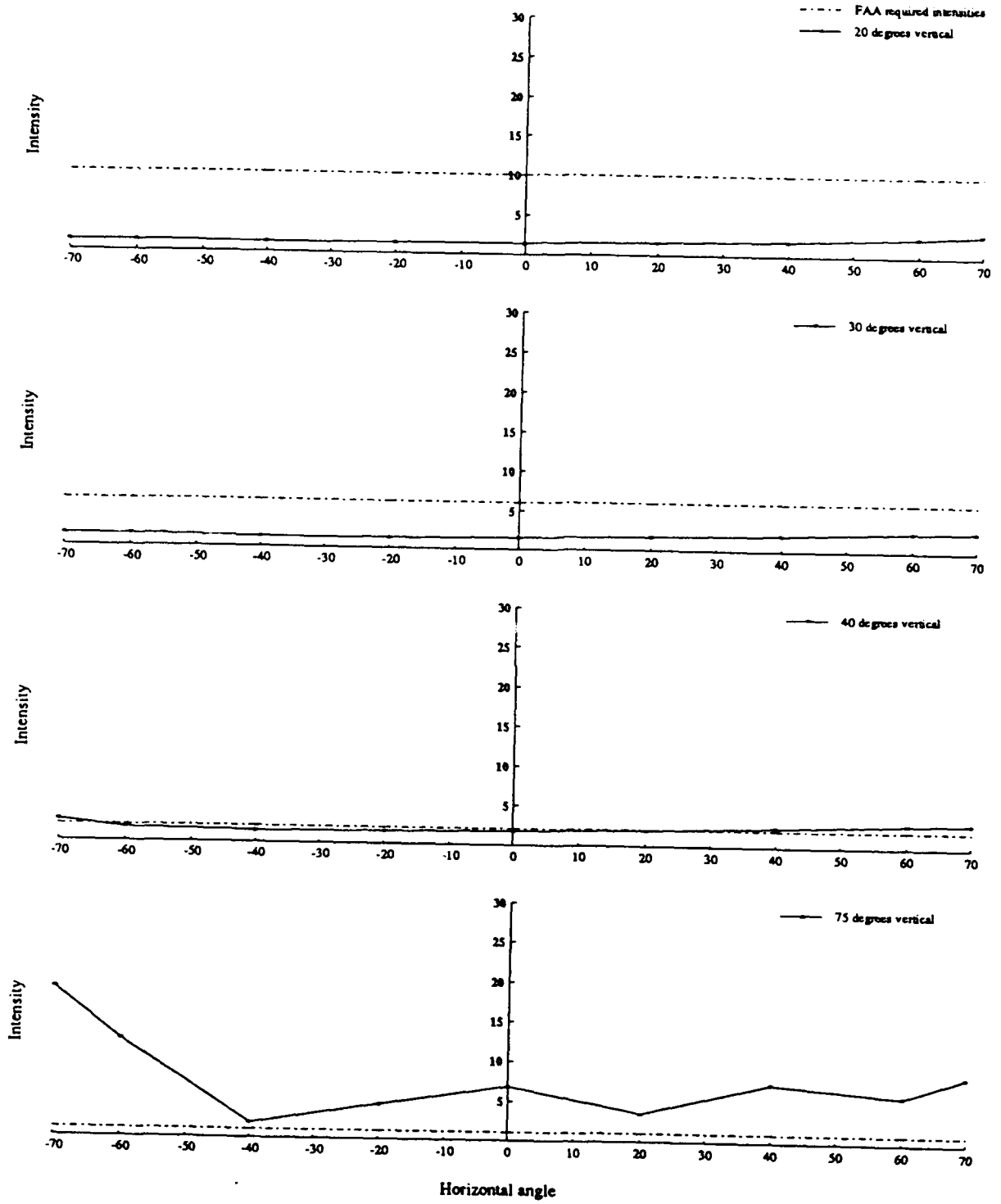

Figure H-2b. Intensity profiles for OH-58A, C, or D/AH-1 masked tail position light in bright mode; top, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

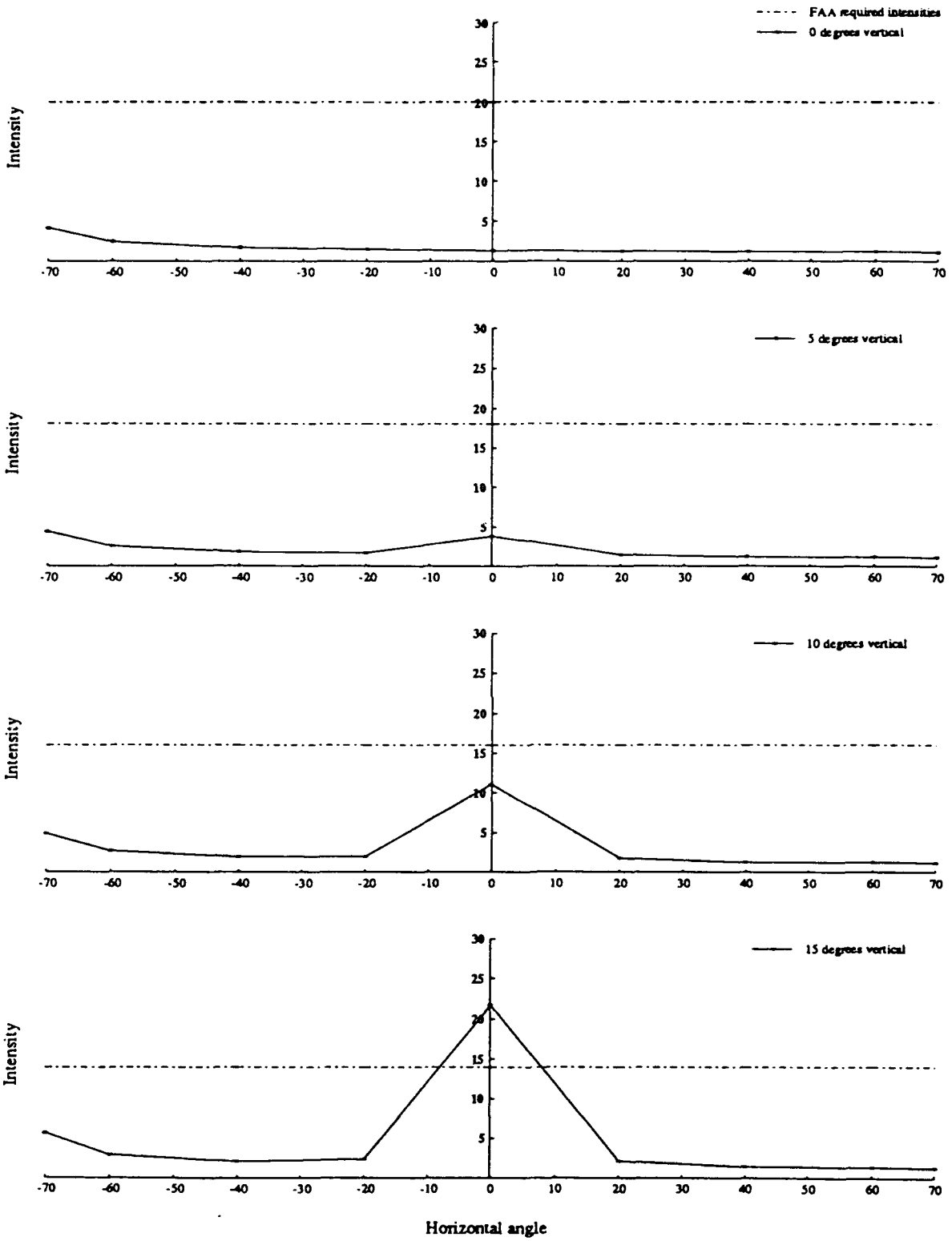

Figure H-2c. Intensity profiles for OH-58A, C, or D/AH-1 masked tail position light in bright mode; bottom, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

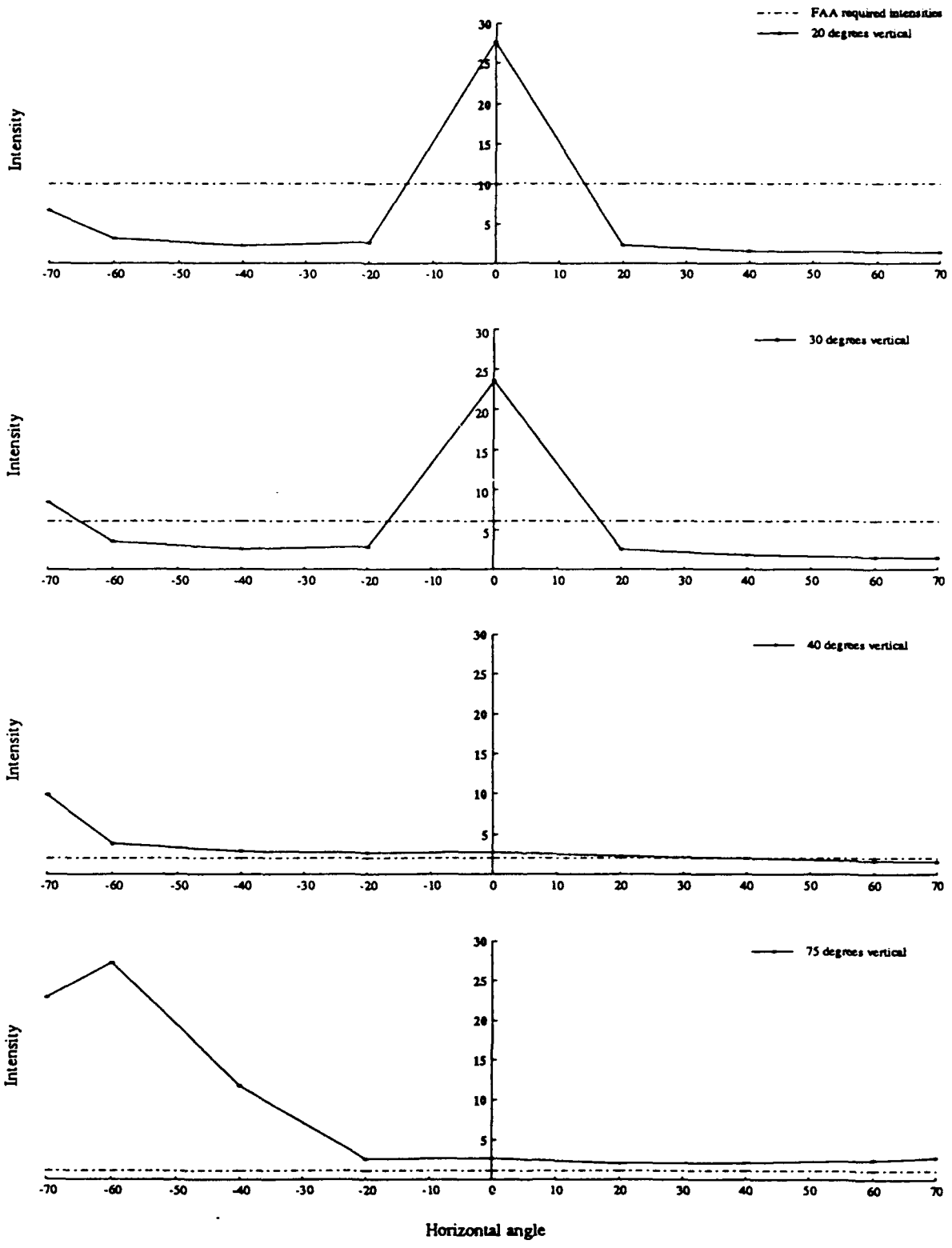

Figure H-2d. Intensity profiles for OH-58A, C, or D/AH-1 masked tail position light in bright mode; bottom, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

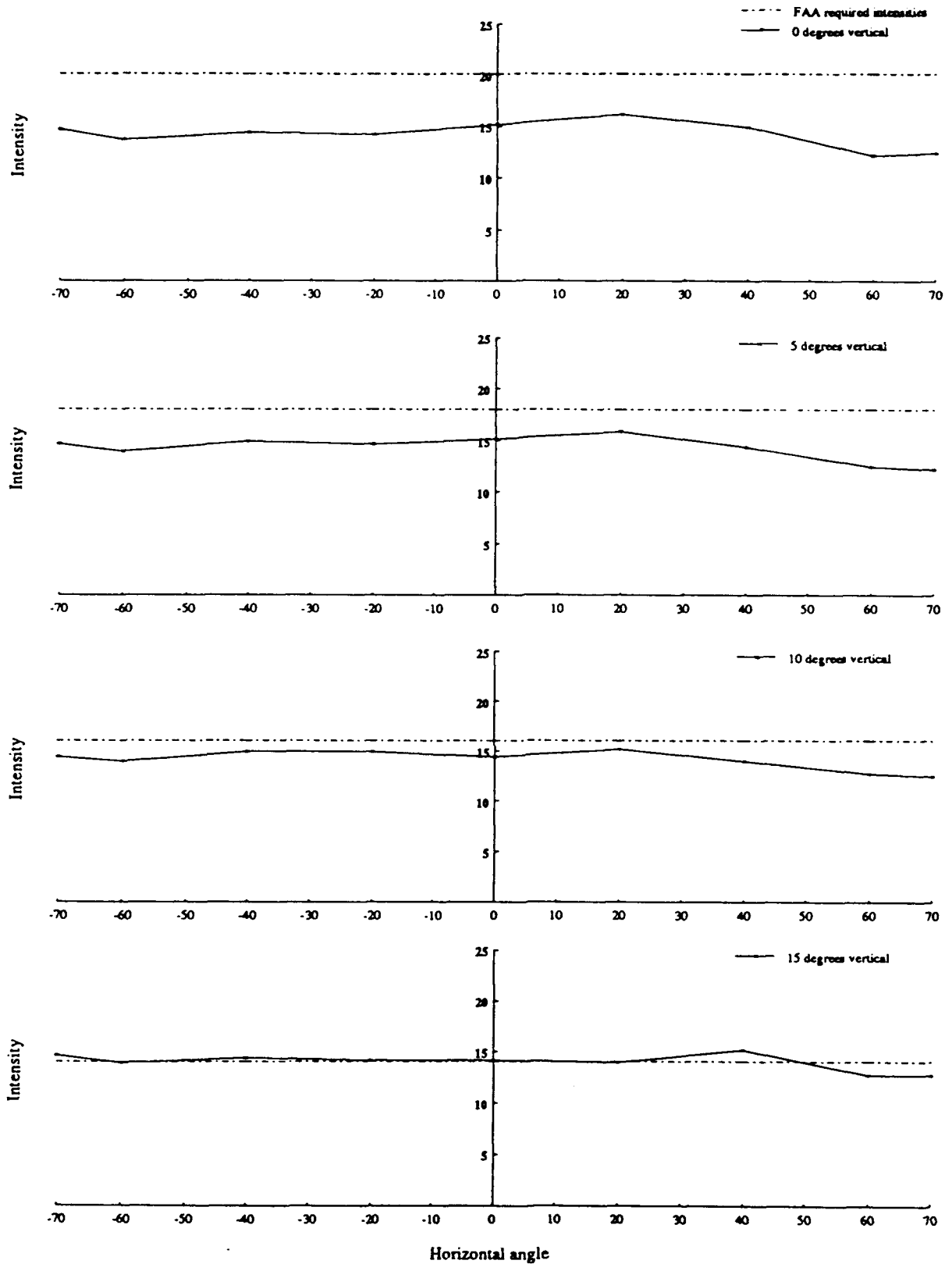

Figure H-3a. Intensity profiles for OH-58A, C, or D/AH-1 unmasked tail position light in dim mode; top, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

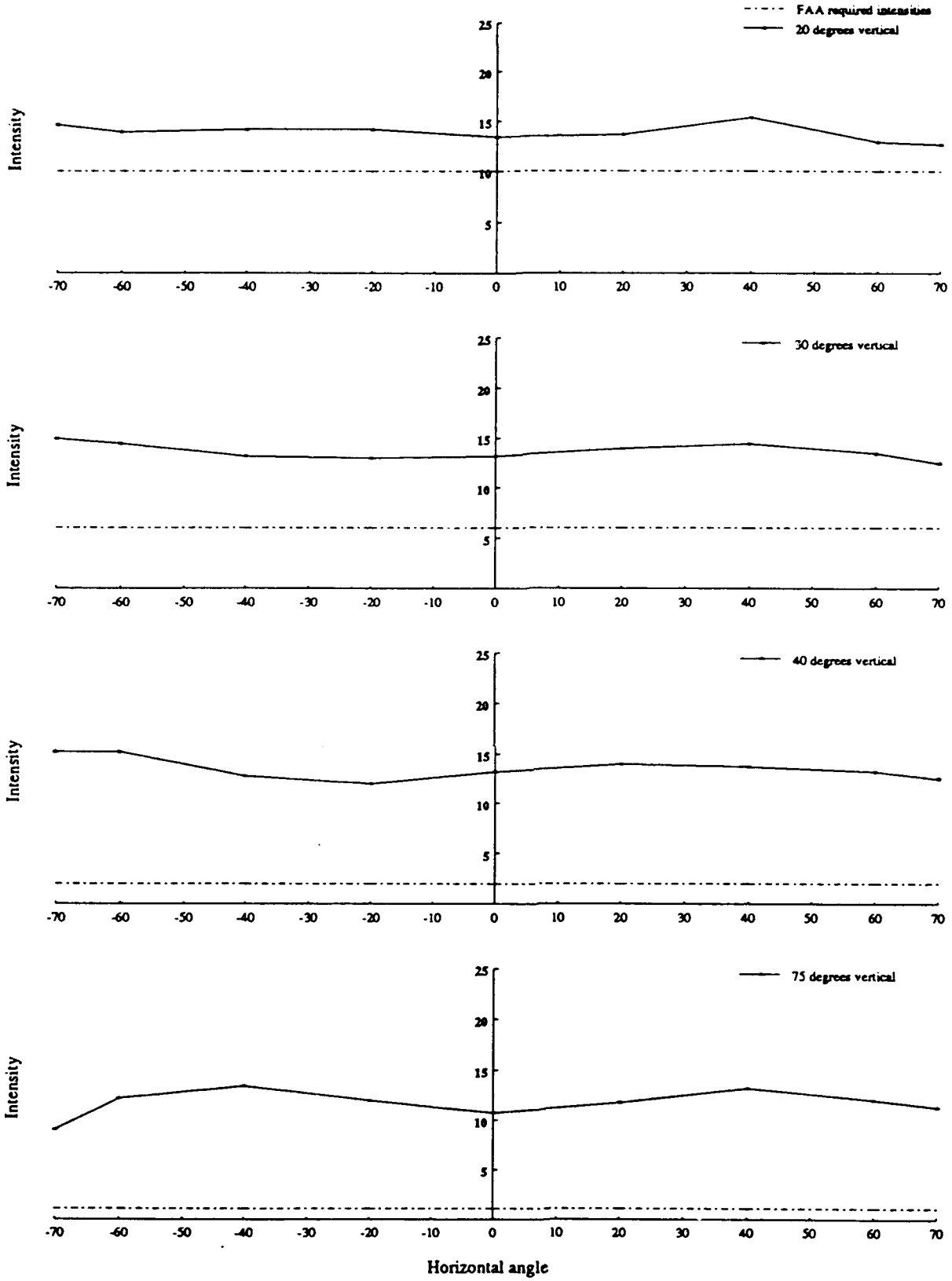

Figure H-3b. Intensity profiles for OH-58A, C, or D/AH-1 unmasked tail position light in dim mode; top, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

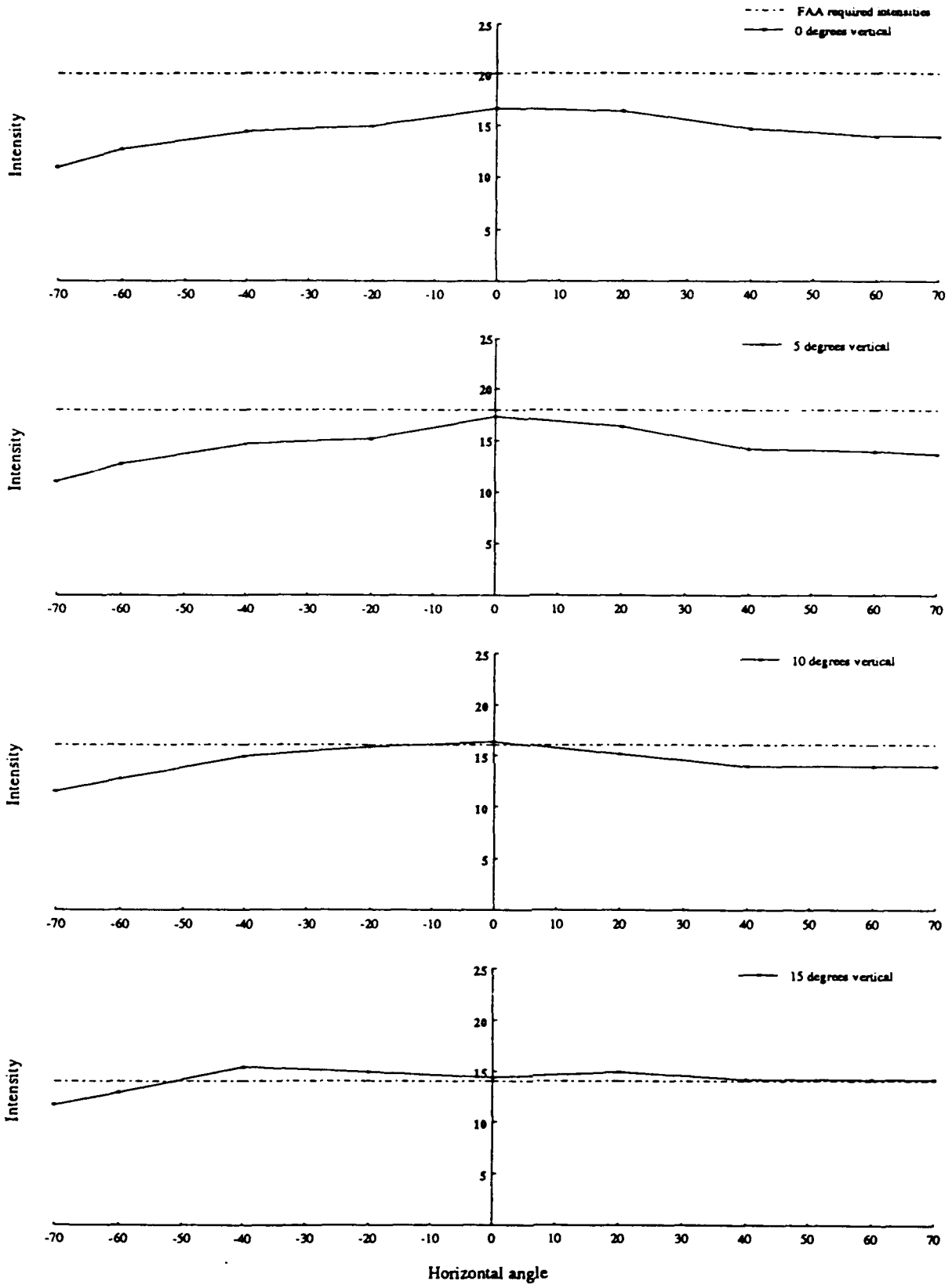

Figure H-3c. Intensity profiles for OH-58A, C, or D/AH-1 unmasked tail position light in dim mode; bottom, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

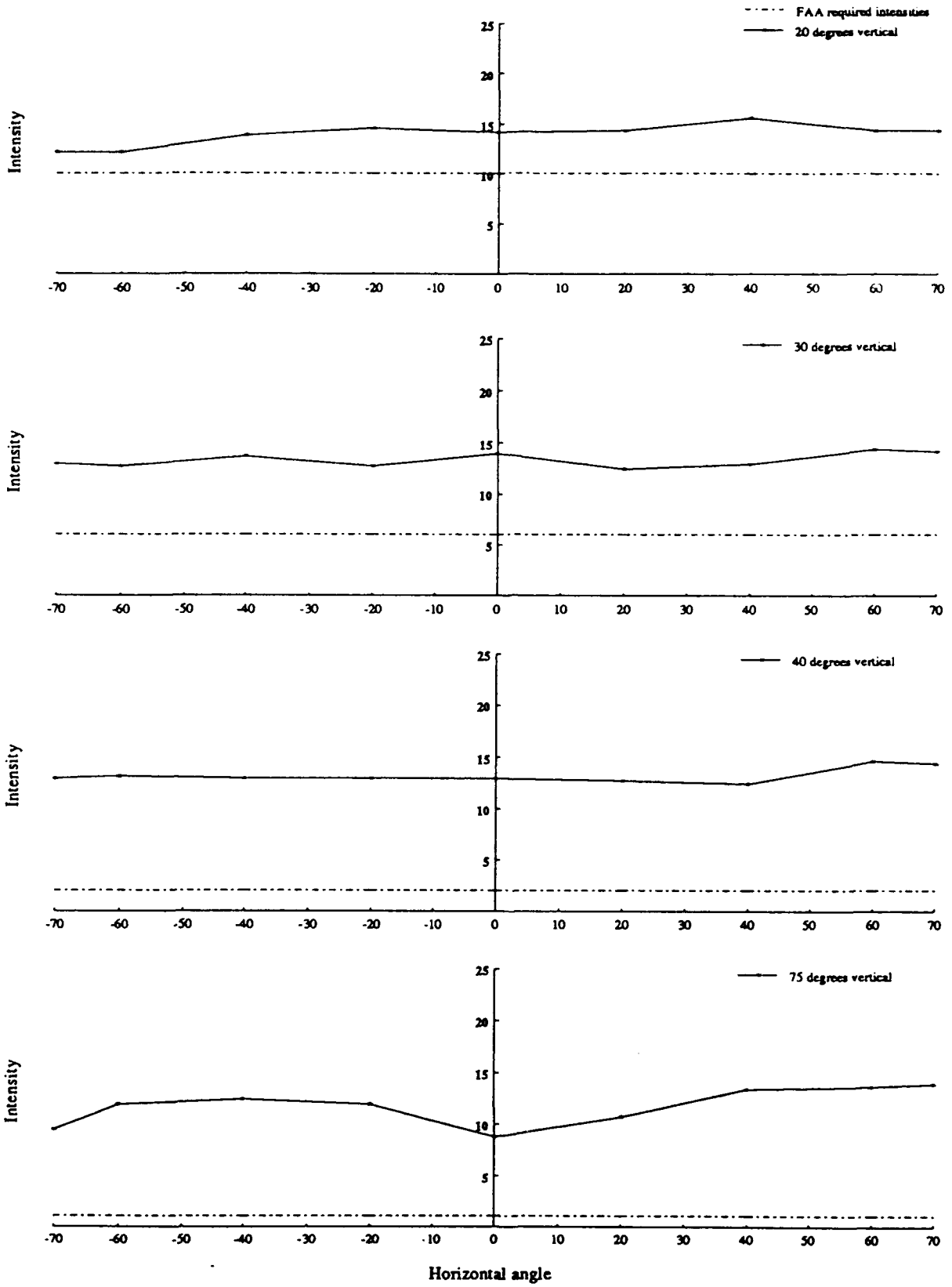

Figure H-3d. Intensity profiles for OH-58A, C, or D/AH-1 unmasked tail position light in dim mode; bottom, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

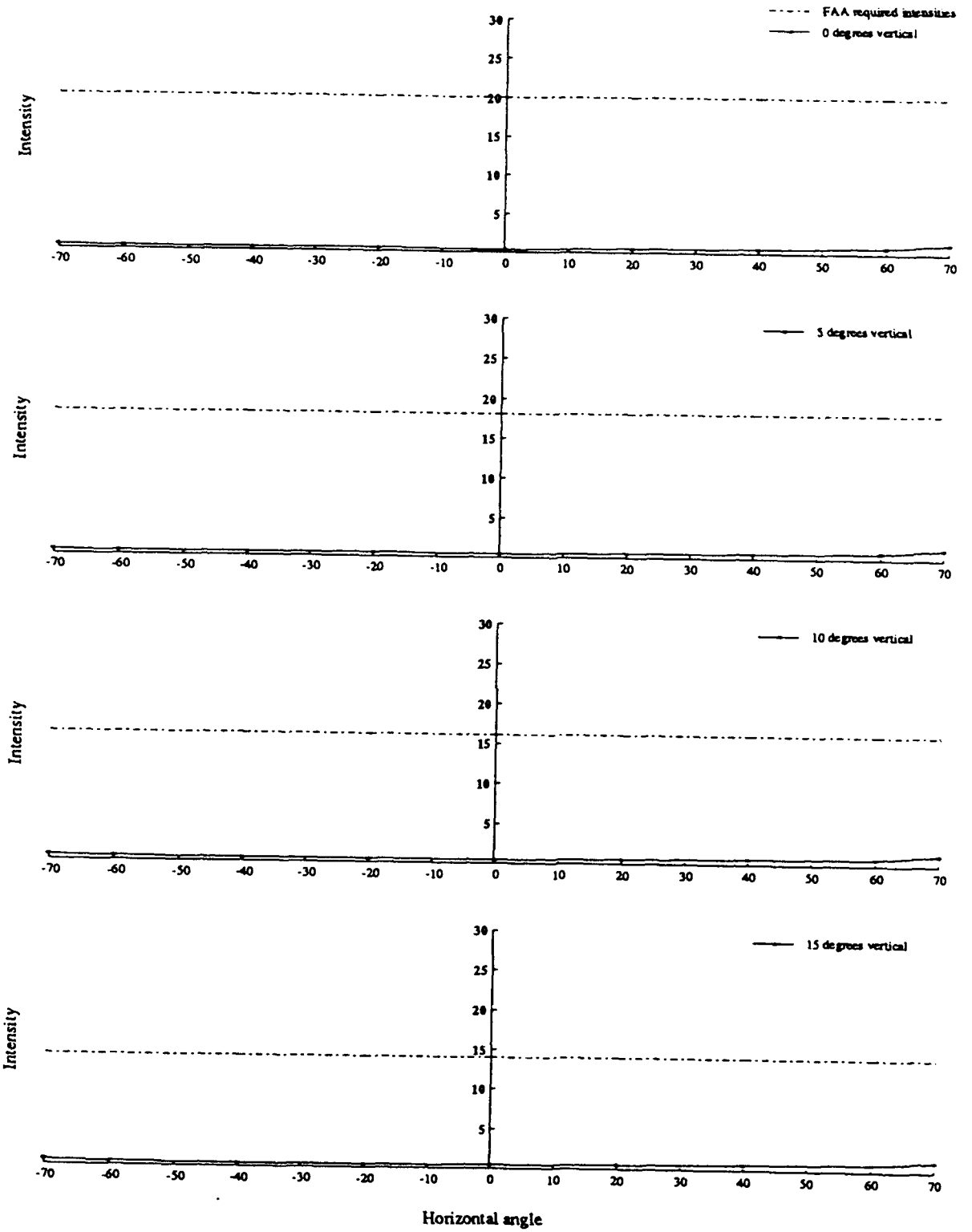

Figure H-4a. Intensity profiles for OH-58A, C, or D/AH-1 masked tail position light in dim mode; top, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

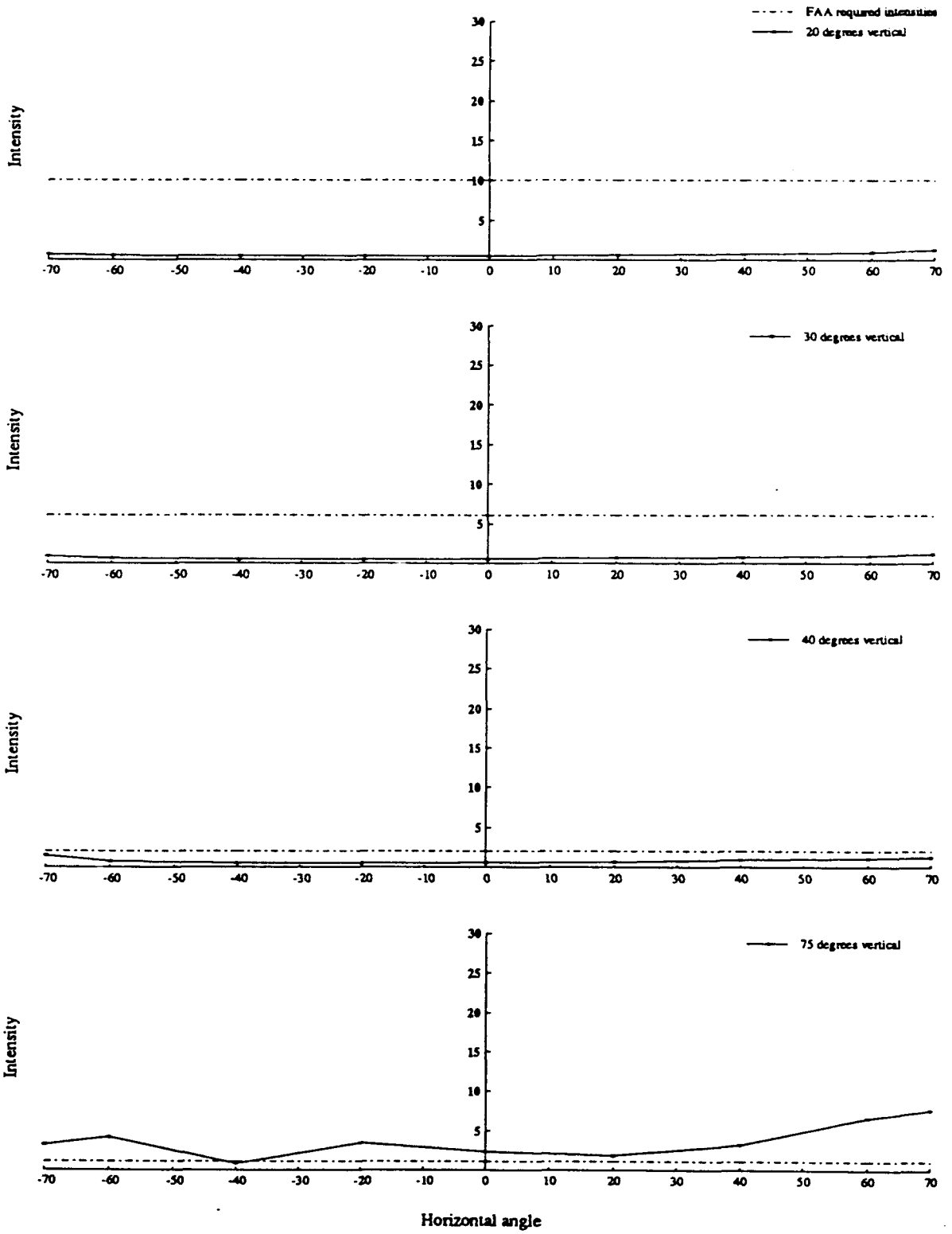

Figure H-4b. Intensity profiles for OH-58A, C, or D/AH-1 masked tail position light in dim mode; top, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

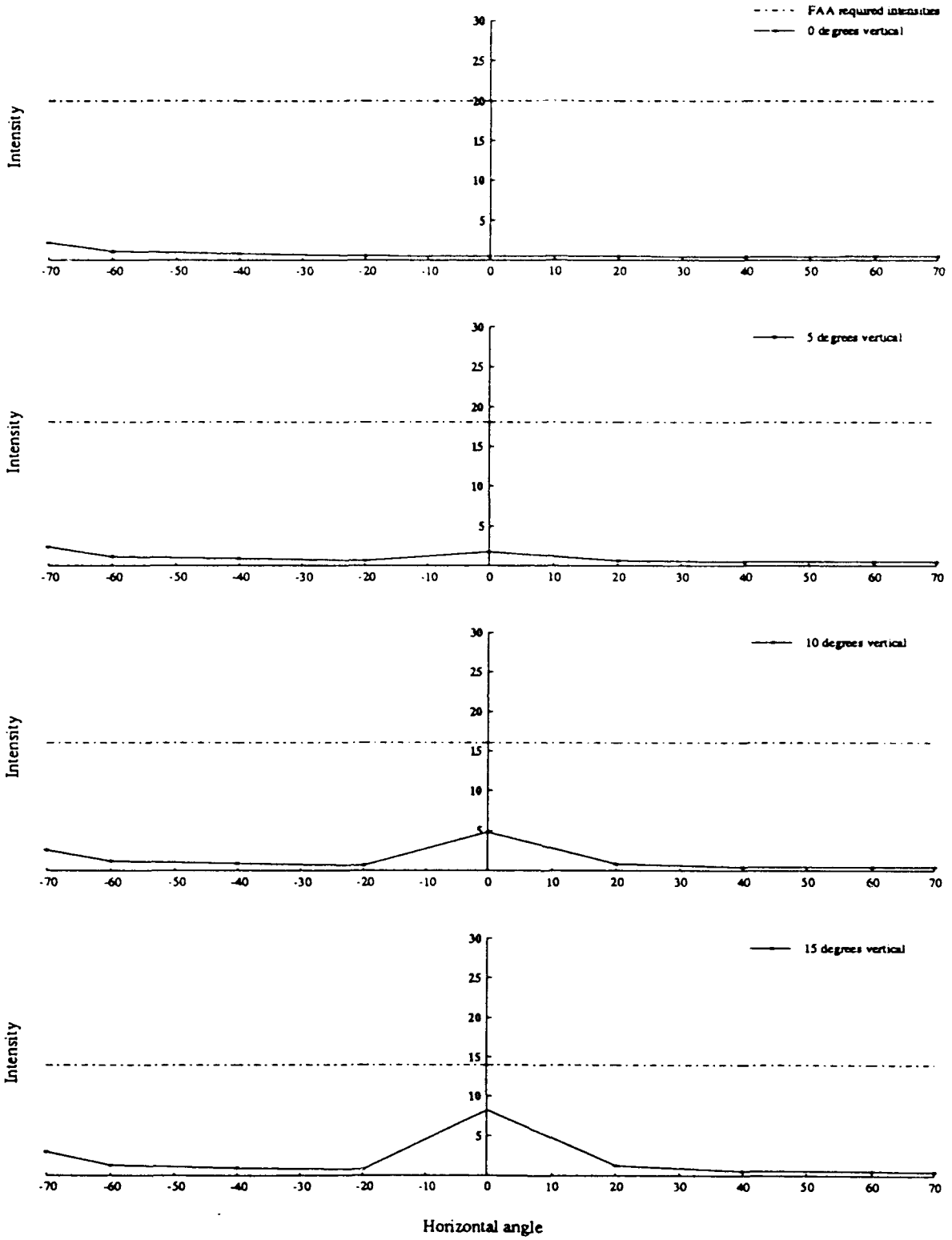

Figure H-4c. Intensity profiles for OH-58A, C, or D/AH-1 masked tail position light in dim mode; bottom, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

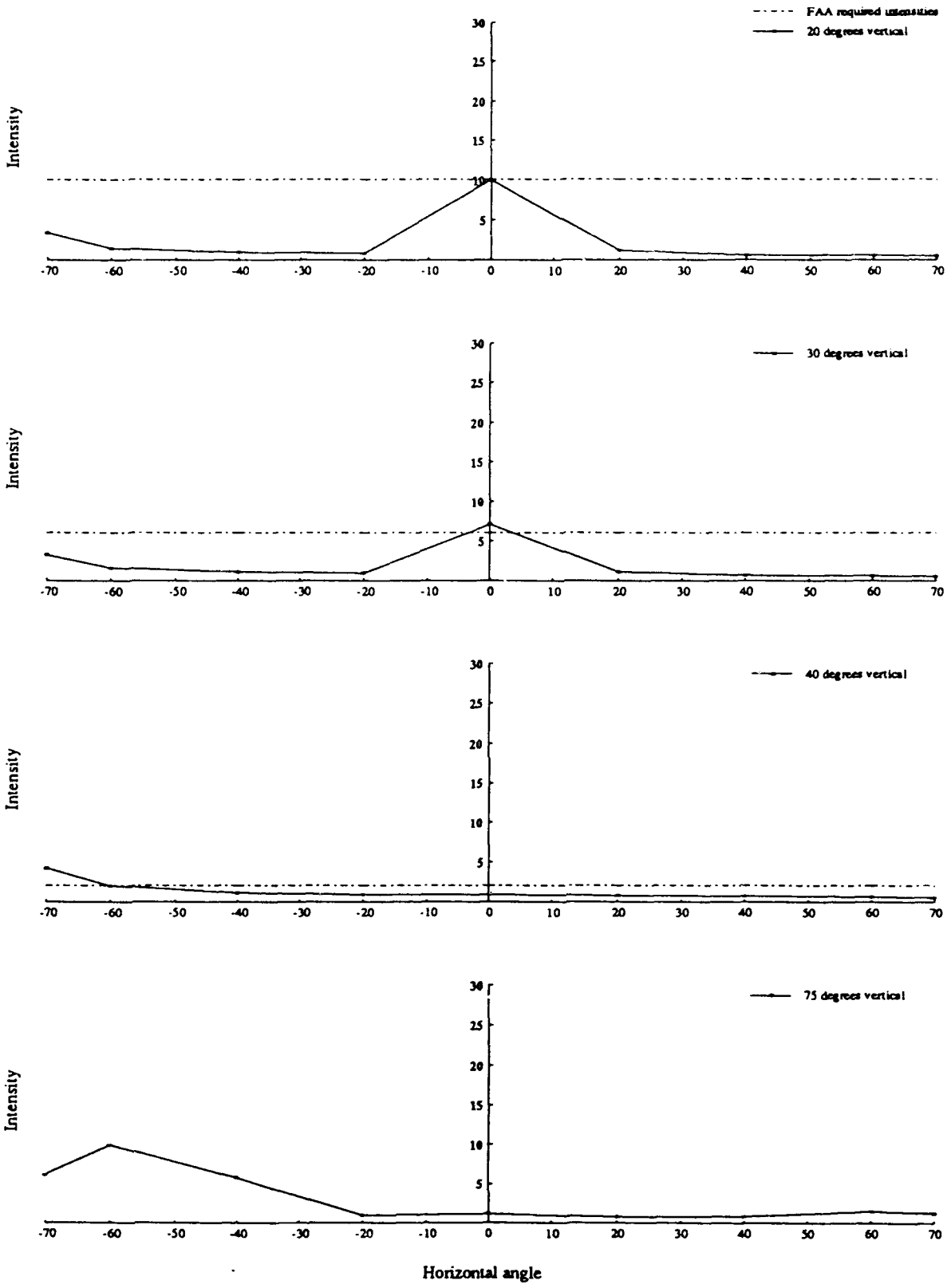

Figure H-4d. Intensity profiles for OH-58A, C, or D/AH-1 masked tail position light in dim mode; bottom, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

Table H-1a.

Measured data and calculated intensity values for OH-58A, C, or D/AH-1 tail position light, single samples; unmasked, bright. Intensity expressed in candelas.

UNMASKED/BRIGHT — Instrument readings — 28 Oct. 1992

CW — horizontal angle

	v	0	20	40	60	70
	0	159	151	168	127	122
e	5	146	147	160	128	124
r	10	136	139	158	127	123
t	15	133	146	166	128	124
	20	132	131	165	128	124
TOP	30	122	129	140	130	124
	40	116	129	132	134	122
	75	101	106	124	121	106
	90					

UNMASKED/BRIGHT — Instrument readings — 29 Oct. 1992

CW — horizontal angle

	v	0	20	40	60	70
	0	168	141	159	135	146
e	5	169	148	146	135	146
r	10	156	160	136	135	147
t	15	138	142	151	137	148
	20	138	140	142	138	151
BOT	30	137	127	129	140	150
	40	121	118	122	141	149
	75	85	102	128	128	128
	90					

d=15.625' — CW

	v	0	20	40	60	70
	0	38.82	36.87	41.02	31.01	29.79
e	5	35.64	35.89	39.06	31.25	30.27
r	10	33.20	33.94	38.57	31.01	30.03
t	15	32.47	35.64	40.53	31.25	30.27
	20	32.23	31.98	40.28	31.25	30.27
TOP	30	29.79	31.49	34.18	31.74	30.27
	40	28.32	31.49	32.23	32.71	29.79
	75	24.66	25.88	30.27	29.54	25.88
	90					

d=15.7396 — CW

	v	0	20	40	60	70
	0	41.62	34.93	39.39	33.44	36.17
e	5	41.87	36.66	36.17	33.44	36.17
r	10	38.65	39.64	33.69	33.44	36.42
t	15	34.19	35.18	37.41	33.94	36.66
	20	34.19	34.68	35.18	34.19	37.41
BOT	30	33.94	31.46	31.96	34.68	37.16
	40	29.98	29.23	30.22	34.93	36.91
	75	21.06	25.27	31.71	31.71	31.71
	90					

Instrument readings — 28 Oct. 1992

CCW — horizontal angle

	v	0	20	40	60	70
	0	158	139	143	131	142
e	5	144	143	142	132	139
r	10	135	128	145	132	139
t	15	132	132	137	132	142
	20	132	132	135	134	144
TOP	30	119	127	127	140	145
	40	118	116	124	145	146
	75	101	113	130	111	81
	90					

Instrument readings — 29 Oct. 1992

CCW — horizontal angle

	v	0	20	40	60	70
	0	172	144	152	130	110
e	5	170	154	149	130	112
r	10	158	162	152	128	113
t	15	139	151	148	126	118
	20	140	150	144	126	120
BOT	30	133	144	140	125	126
	40	122	132	125	129	130
	75	86	118	130	124	94
	90					

d=15.625' — CCW

	v	0	20	40	60	70
	0	38.57	33.94	34.91	31.98	34.67
e	5	35.16	34.91	34.67	32.23	33.94
r	10	32.96	31.25	35.40	32.23	33.94
t	15	32.23	32.23	33.45	32.23	34.67
	20	32.23	32.23	32.96	32.71	35.16
TOP	30	29.05	31.01	31.01	34.18	35.40
	40	28.81	28.32	30.27	35.40	35.64
	75	24.66	27.59	31.74	27.10	19.78
	90					

d=15.7396 — CCW

	v	0	20	40	60	70
	0	42.61	35.67	37.66	32.21	27.25
e	5	42.11	38.15	36.91	32.21	27.75
r	10	39.14	40.13	37.66	31.71	27.99
t	15	34.44	37.41	36.66	31.21	29.23
	20	34.68	37.16	35.67	31.21	29.73
BOT	30	32.95	35.67	34.68	30.97	31.21
	40	30.22	32.70	30.97	31.96	32.21
	75	21.31	29.23	32.21	30.72	23.29
	90					

Table H-1b.

Measured data and calculated intensity values for OH-58A, C, or D/AH-1 tail position light, single samples; masked, bright. Intensity expressed in candelas.

MASKED/BRIGHT — Instrument readings — 6 Apr. 1993

		CW horizontal angle 0	20	40	60	70
v	0	4	6	6	9	12
e	5	4	6	6	9	12
r	10	5	6	7	9	12
t	15	5	6	7	9	12
	20	6	6	7	10	11
TOP	30	6	7	8	10	11
	40	7	8	10	12	12
	75	28	14	30	24	34
	90					

d=15.71875' — candle power values

		CW horizontal angle 0	20	40	60	70
v	0	1.04	1.48	1.51	2.15	2.99
e	5	1.06	1.51	1.56	2.20	2.96
r	10	1.14	1.51	1.63	2.22	2.89
t	15	1.26	1.48	1.75	2.30	2.87
	20	1.36	1.58	1.83	2.37	2.79
TOP	30	1.56	1.73	2.03	2.52	2.64
	40	1.78	1.98	2.40	2.92	3.01
	75	6.82	3.51	7.36	5.88	8.43
	90					

MASKED/BRIGHT — Instrument readings — 6 Apr. 1993

		CW horizontal angle 0	20	40	60	70
v	0	5	5	5	5	4
e	5	15	6	5	5	5
r	10	45	7	5	5	5
t	15	88	9	6	6	5
	20	112	9	6	6	5
BOT	30	95	10	7	6	6
	40	11	9	8	7	6
	75	11	8	8	10	11
	90					

d=15.72917' — candle power values

		CW horizontal angle 0	20	40	60	70
v	0	1.31	1.21	1.14	1.14	1.06
e	5	3.76	1.43	1.21	1.24	1.16
r	10	11.08	1.76	1.31	1.29	1.21
t	15	21.70	2.10	1.41	1.36	1.26
	20	27.71	2.30	1.53	1.43	1.34
BOT	30	23.53	2.47	1.81	1.48	1.41
	40	2.75	2.28	2.03	1.61	1.53
	75	2.62	2.00	2.08	2.42	2.70
	90					

Instrument readings — 6 Apr. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		4	4	4	4
e	5		4	4	4	4
r	10		5	5	4	4
t	15		5	5	5	5
	20		5	5	5	5
TOP	30		6	5	6	6
	40		6	6	7	10
	75		18	8	50	76
	90					

d=15.71875' — candle power values

		CCW horizontal angle 0	20	40	60	70
v	0	0.00	1.04	0.94	0.94	0.56
e	5	0.00	1.06	1.09	0.99	1.01
r	10	0.00	1.11	1.14	1.06	1.06
t	15	0.00	1.14	1.14	1.14	1.11
	20	0.00	1.26	1.19	1.26	1.19
TOP	30	0.00	1.36	1.28	1.56	1.48
	40	0.00	1.53	1.43	1.66	2.54
	75	0.00	4.40	1.90	12.33	18.80
	90					

Instrument readings — 6 Apr. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		6	7	10	17
e	5		7	7	10	18
r	10		8	8	11	20
t	15		10	9	12	23
	20		11	9	13	27
BOT	30		12	10	14	34
	40		11	12	16	40
	75		10	48	110	93
	90					

d=15.72917' — candle power values

		CCW horizontal angle 0	20	40	60	70
v	0	0.00	1.51	1.66	2.40	4.11
e	5	0.00	1.71	1.81	2.55	4.35
r	10	0.00	1.98	1.95	2.72	4.82
t	15	0.00	2.35	2.10	2.92	5.62
	20	0.00	2.65	2.25	3.17	6.75
BOT	30	0.00	2.85	2.55	3.51	8.41
	40	0.00	2.67	2.87	3.83	9.92
	75	0.00	2.55	11.80	27.29	22.96
	90					

Table H-1c.

Measured data and calculated intensity values for OH-58A, C, or D/AH-1 tail position light, single samples; unmasked, dim. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 7 Dec. 1992

		CW horizontal angle 0	20	40	60	70
v	0	62	66	61	50	51
e	5	62	65	59	51	50
r	10	59	62	57	52	51
t	15	58	57	62	52	52
	20	55	56	63	53	52
TOP	30	54	57	59	55	51
	40	54	57	56	54	51
	75	44	48	54	49	46
	90					

UNMASKED/DIM — Instrument readings — 7 Dec. 1992

		CW horizontal angle 0	20	40	60	70
v	0	68	67	60	57	57
e	5	71	67	58	57	56
r	10	67	62	57	57	57
t	15	59	61	58	58	58
	20	58	59	64	59	59
BOT	30	57	51	53	59	58
	40	53	52	51	60	59
	75	36	44	55	56	57
	90					

d= 15.625" — candle power values

		CW horizontal angle 0	20	40	60	70
v	0	15.14	16.11	14.89	12.21	12.45
e	5	15.14	15.87	14.40	12.45	12.21
r	10	14.40	15.14	13.92	12.70	12.45
t	15	14.16	13.92	15.14	12.70	12.70
	20	13.43	13.67	15.38	12.94	12.70
TOP	30	13.18	13.92	14.40	13.43	12.45
	40	13.18	13.92	13.67	13.18	12.45
	75	10.74	11.72	13.18	11.96	11.23
	90					

d= 15.625" — candle power values

		CW horizontal angle 0	20	40	60	70
v	0	16.60	16.36	14.65	13.92	13.92
e	5	17.33	16.36	14.16	13.92	13.67
r	10	16.36	15.14	13.92	13.92	13.92
t	15	14.40	14.89	14.16	14.16	14.16
	20	14.16	14.40	15.63	14.40	14.40
BOT	30	13.92	12.45	12.94	14.40	14.16
	40	12.94	12.70	12.45	14.65	14.40
	75	8.79	10.74	13.43	13.67	13.92
	90					

Instrument readings — 7 Dec. 1992

		CCW horizontal angle 0	20	40	60	70
v	0	62	58	59	56	60
e	5	62	60	61	57	60
r	10	59	61	61	57	59
t	15	58	58	59	57	60
	20	55	58	58	57	60
TOP	30	54	53	54	59	61
	40	54	49	52	62	62
	75	44	49	55	50	37
	90					

Instrument readings — 7 Dec. 1992

		CCW horizontal angle 0	20	40	60	70
v	0	68	61	59	52	45
e	5	71	62	60	52	45
r	10	67	65	61	52	47
t	15	59	61	63	53	48
	20	58	60	57	50	50
BOT	30	57	52	56	52	53
	40	53	53	53	54	53
	75	36	49	51	49	39
	90					

d= 15.625" — candle power values

		CCW horizontal angle 0	20	40	60	70
v	0	15.14	14.16	14.40	13.67	14.65
e	5	15.14	14.65	14.89	13.92	14.65
r	10	14.40	14.89	14.89	13.92	14.40
t	15	14.16	14.16	14.40	13.92	14.65
	20	13.43	14.16	14.16	13.92	14.65
TOP	30	13.18	12.94	13.18	14.40	14.89
	40	13.18	11.96	12.70	15.14	15.14
	75	10.74	11.96	13.43	12.21	9.03
	90					

d= 15.625" — candle power values

		CCW horizontal angle 0	20	40	60	70
v	0	16.60	14.89	14.40	12.70	10.99
e	5	17.33	15.14	14.65	12.70	10.99
r	10	16.36	15.87	14.89	12.70	11.47
t	15	14.40	14.89	15.38	12.94	11.72
	20	14.16	14.65	13.92	12.21	12.21
BOT	30	13.92	12.70	13.67	12.70	12.94
	40	12.94	12.94	12.94	13.18	12.94
	75	8.79	11.96	12.45	11.96	9.52
	90					

Table H-1d.

Measured data and calculated intensity values for OH-58A, C, or D/AH-1 tail position light, single samples; masked, dim. Intensity expressed in candelas.

MASKED/DIM — Instrument readings — 8 Apr. 1993

		CW 0	20	40	60	70
v	0	1	2	2	3	5
e	5	2	2	3	3	5
r	10	2	2	3	3	5
t	15	2	2	3	4	5
	20	2	2	3	4	5
TOP	30	2	3	3	4	5
	40	3	3	4	5	5
	75	10	7	13	27	31
	90					

d=15.73958' — candle power values

		CW 0	20	40	60	70
v	0	0.32	0.52	0.59	0.84	1.31
e	5	0.37	0.55	0.62	0.84	1.31
r	10	0.40	0.55	0.64	0.84	1.26
t	15	0.45	0.55	0.67	0.87	1.26
	20	0.47	0.59	0.72	0.92	1.24
TOP	30	0.57	0.64	0.77	0.97	1.19
	40	0.62	0.64	0.92	1.11	1.31
	75	2.38	1.81	3.20	6.61	7.63
	90					

MASKED/DIM — Instrument readings — 8 Apr. 1993

		CW 0	20	40	60	70
v	0	2	2	2	2	2
e	5	7	2	2	2	2
r	10	19	3	2	2	2
t	15	33	5	2	2	2
	20	40	5	2	2	2
BOT	30	29	4	3	2	2
	40	4	3	3	3	2
	75	5	3	3	6	5
	90					

d=15.73958' — candle power values

		CW 0	20	40	60	70
v	0	0.50	0.50	0.42	0.45	0.47
e	5	1.73	0.59	0.45	0.47	0.47
r	10	4.76	0.84	0.47	0.50	0.47
t	15	8.18	1.21	0.55	0.52	0.47
	20	10.01	1.16	0.55	0.57	0.50
BOT	30	7.16	1.09	0.67	0.59	0.52
	40	0.92	0.84	0.72	0.64	0.55
	75	1.16	0.77	0.79	1.51	1.19
	90					

Instrument readings — 8 Apr. 1993

		CCW 0	20	40	60	70
v	0		2	2	2	2
e	5		2	2	2	2
r	10		2	2	2	2
t	15		2	2	2	2
	20		2	2	2	3
TOP	30		2	2	3	4
	40		2	2	3	6
	75		14	3	17	13
	90					

d=15.73958' — candle power values

		CCW 0	20	40	60	70
v	0	0.00	0.45	0.37	0.42	0.50
e	5	0.00	0.45	0.37	0.42	0.50
r	10	0.00	0.42	0.40	0.47	0.55
t	15	0.00	0.42	0.42	0.50	0.59
	20	0.00	0.47	0.45	0.55	0.67
TOP	30	0.00	0.50	0.47	0.62	0.87
	40	0.00	0.57	0.55	0.72	1.49
	75	0.00	3.42	0.79	4.19	3.25
	90					

Instrument readings — 8 Apr. 1993

		CCW 0	20	40	60	70
v	0		2	3	4	9
e	5		2	4	5	9
r	10		3	4	5	10
t	15		3	4	5	12
	20		3	4	6	14
BOT	30		4	4	7	13
	40		4	5	8	17
	75		4	23	40	25
	90					

d=15.73958' — candle power values

		CCW 0	20	40	60	70
v	0	0.00	0.52	0.82	1.09	2.18
e	5	0.00	0.59	0.87	1.14	2.33
r	10	0.00	0.64	0.89	1.21	2.53
t	15	0.00	0.74	0.92	1.31	2.95
	20	0.00	0.84	0.97	1.39	3.34
BOT	30	0.00	0.94	1.07	1.64	3.20
	40	0.00	0.92	1.16	2.03	4.24
	75	0.00	0.92	5.80	9.86	6.12
	90					

Appendix I.

Intensity profiles, illuminance measurements, and calculated intensities for UH-1 tail position light.

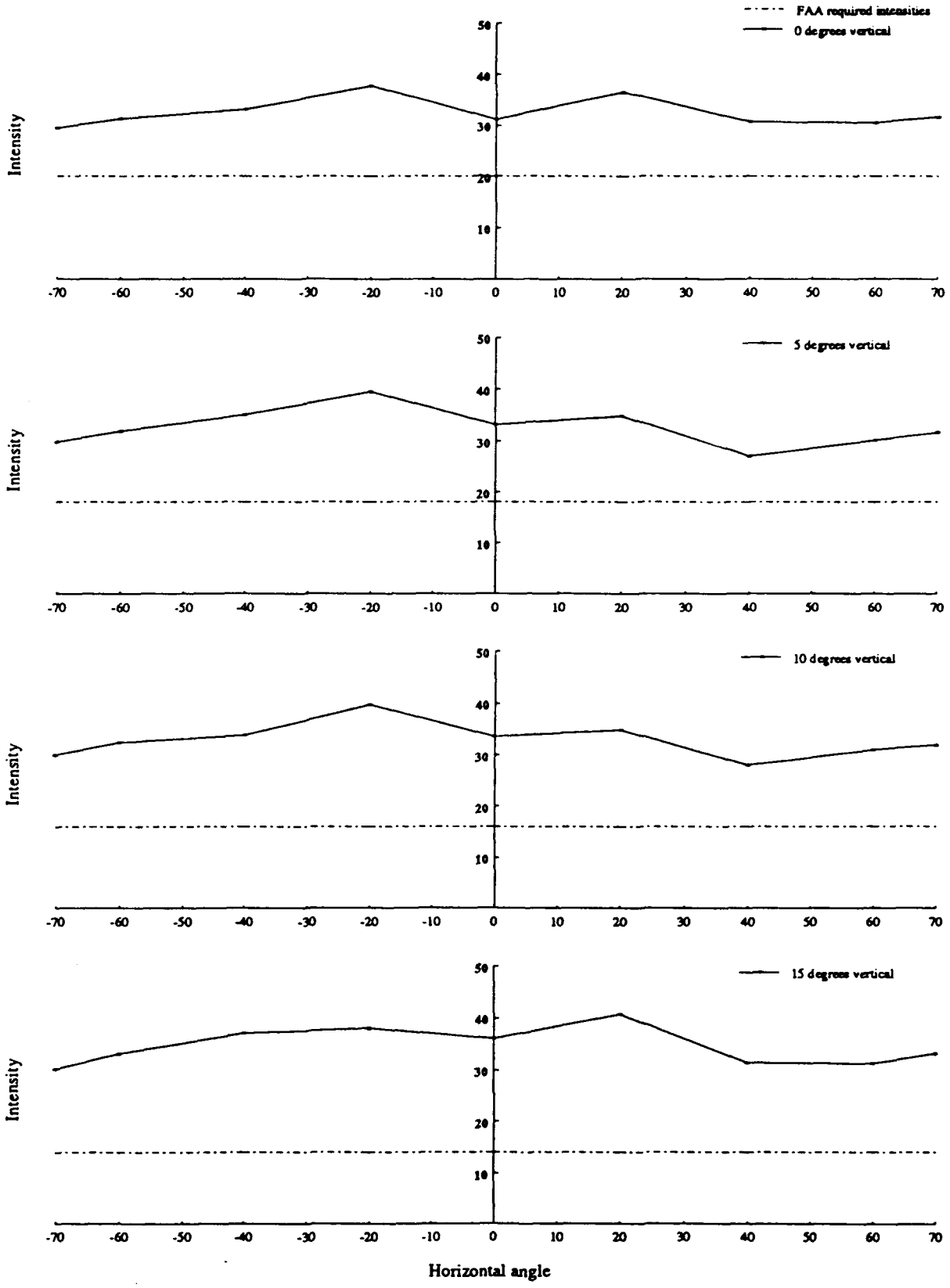

Figure I-1a. Intensity profiles for UH-1 unmasked tail position light in bright mode; top, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

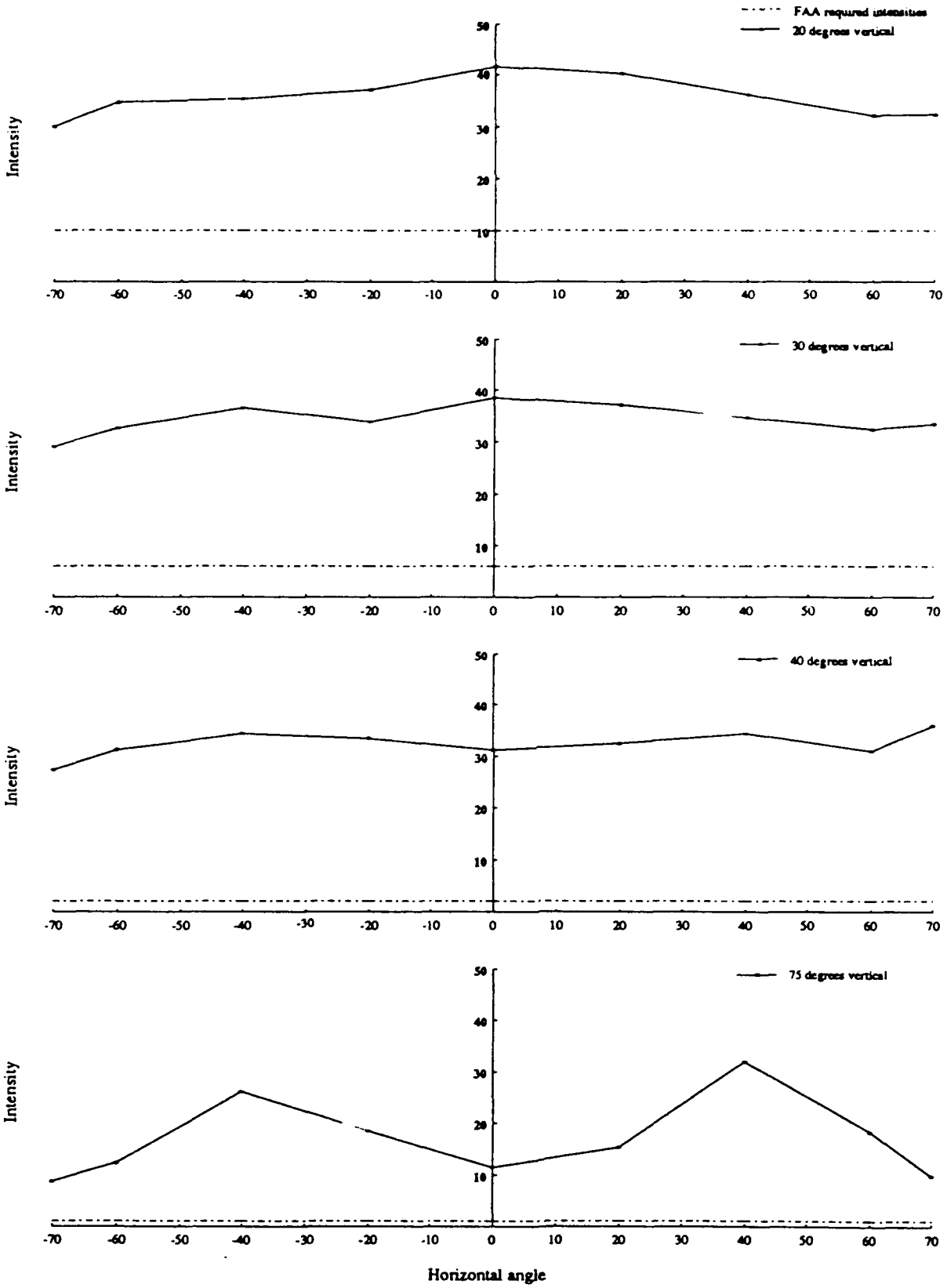

Figure I-1b. Intensity profiles for UH-1 unmasked tail position light in bright mode; top, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

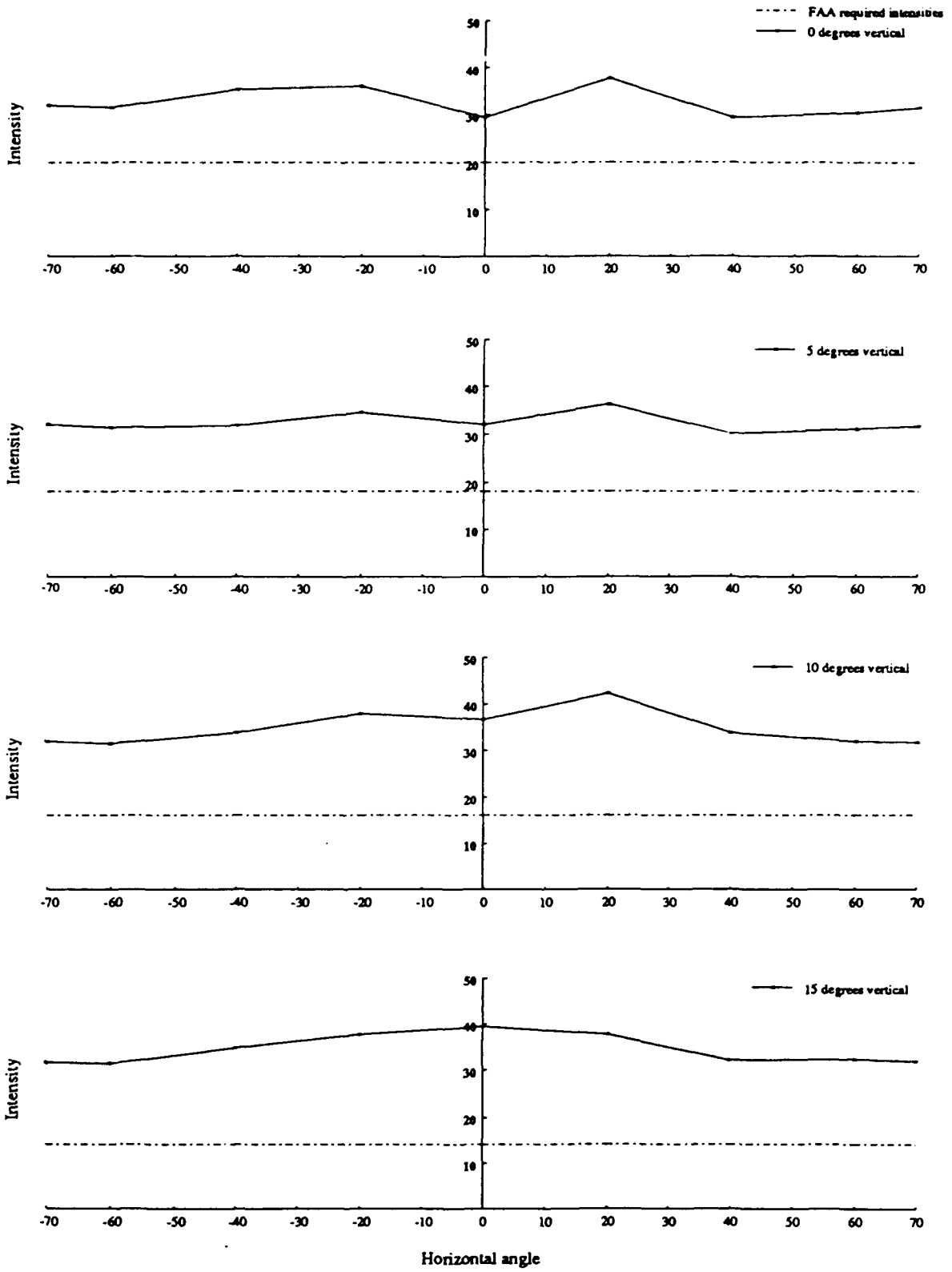

Figure I-1c. Intensity profiles for UH-1 unmasked tail position light in bright mode; bottom, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

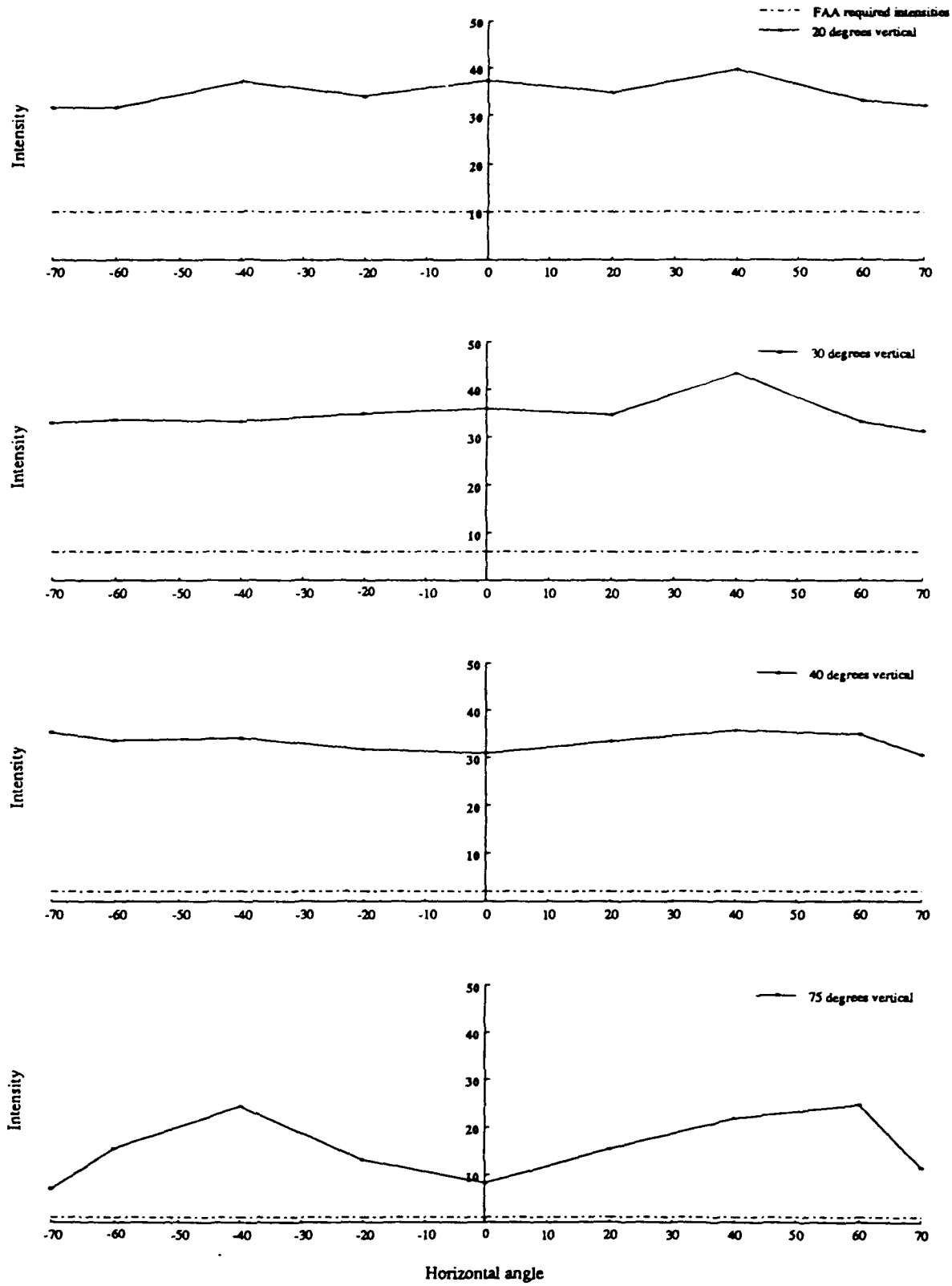

Figure I-1d. Intensity profiles for UH-1 unmasked tail position light in bright mode; bottom, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

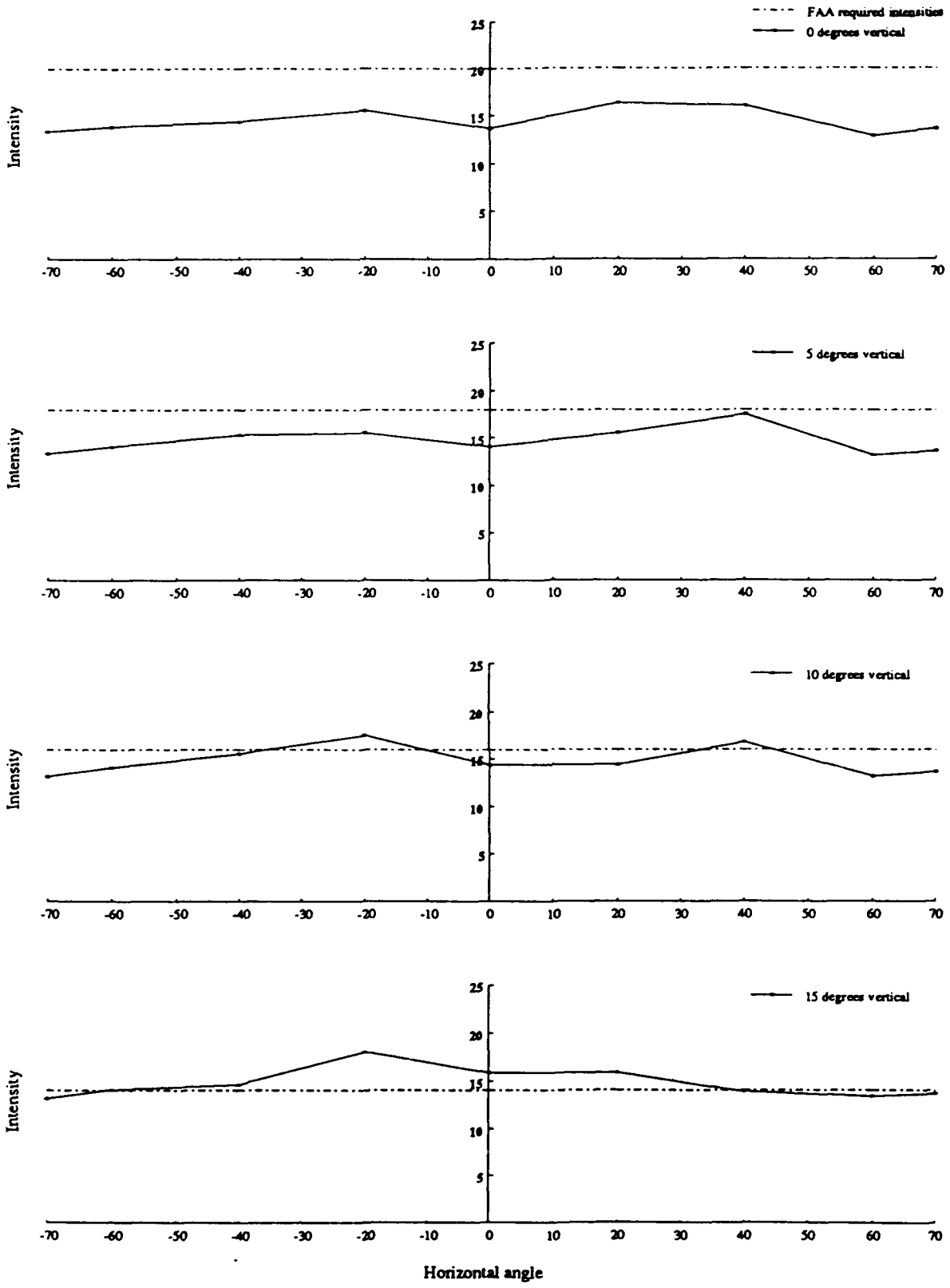

Figure I-2a. Intensity profiles for UH-1 unmasked tail position light in dim mode; top, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

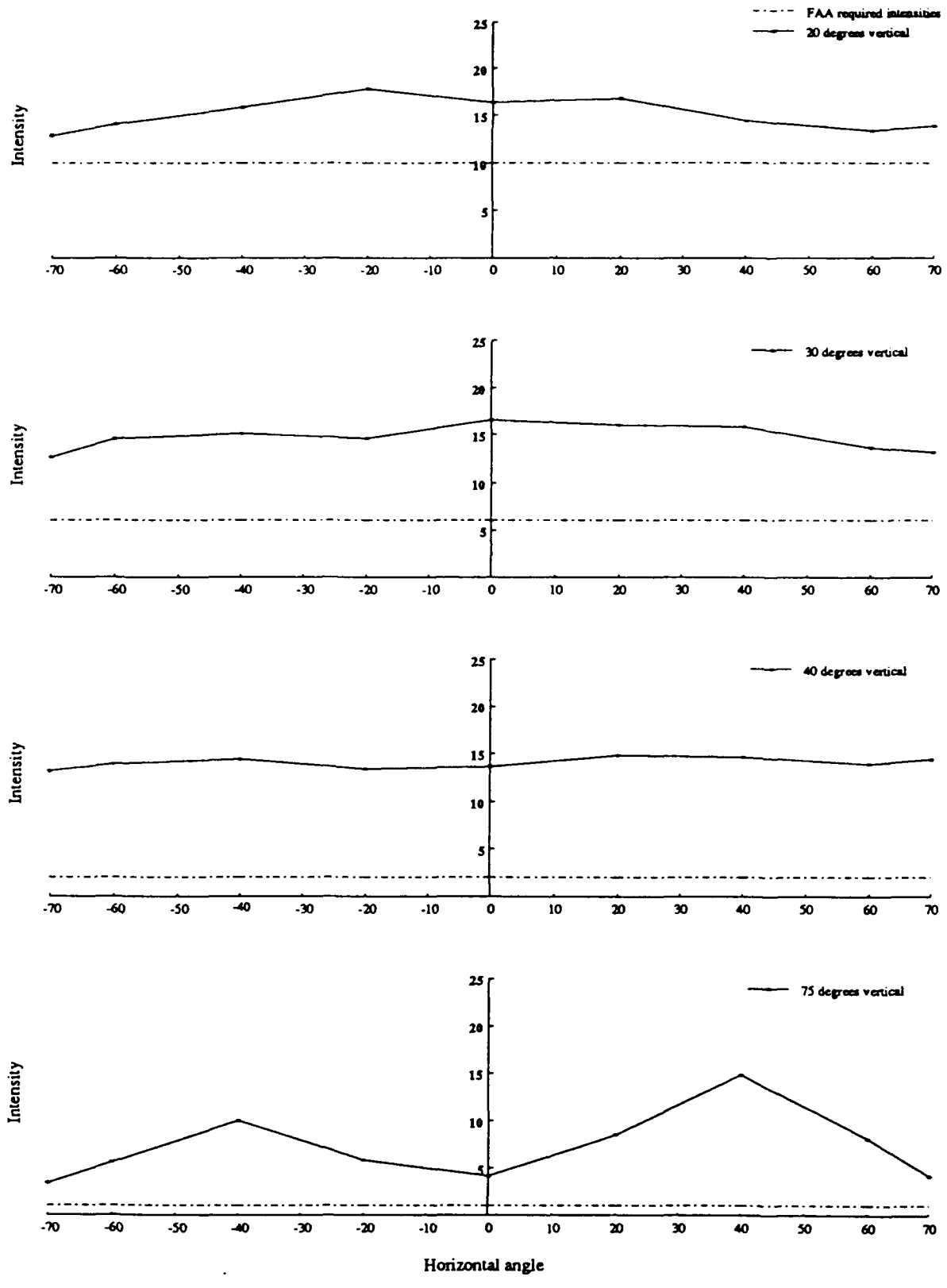

Figure I-2b. Intensity profiles for UH-1 unmasked tail position light in dim mode; top, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

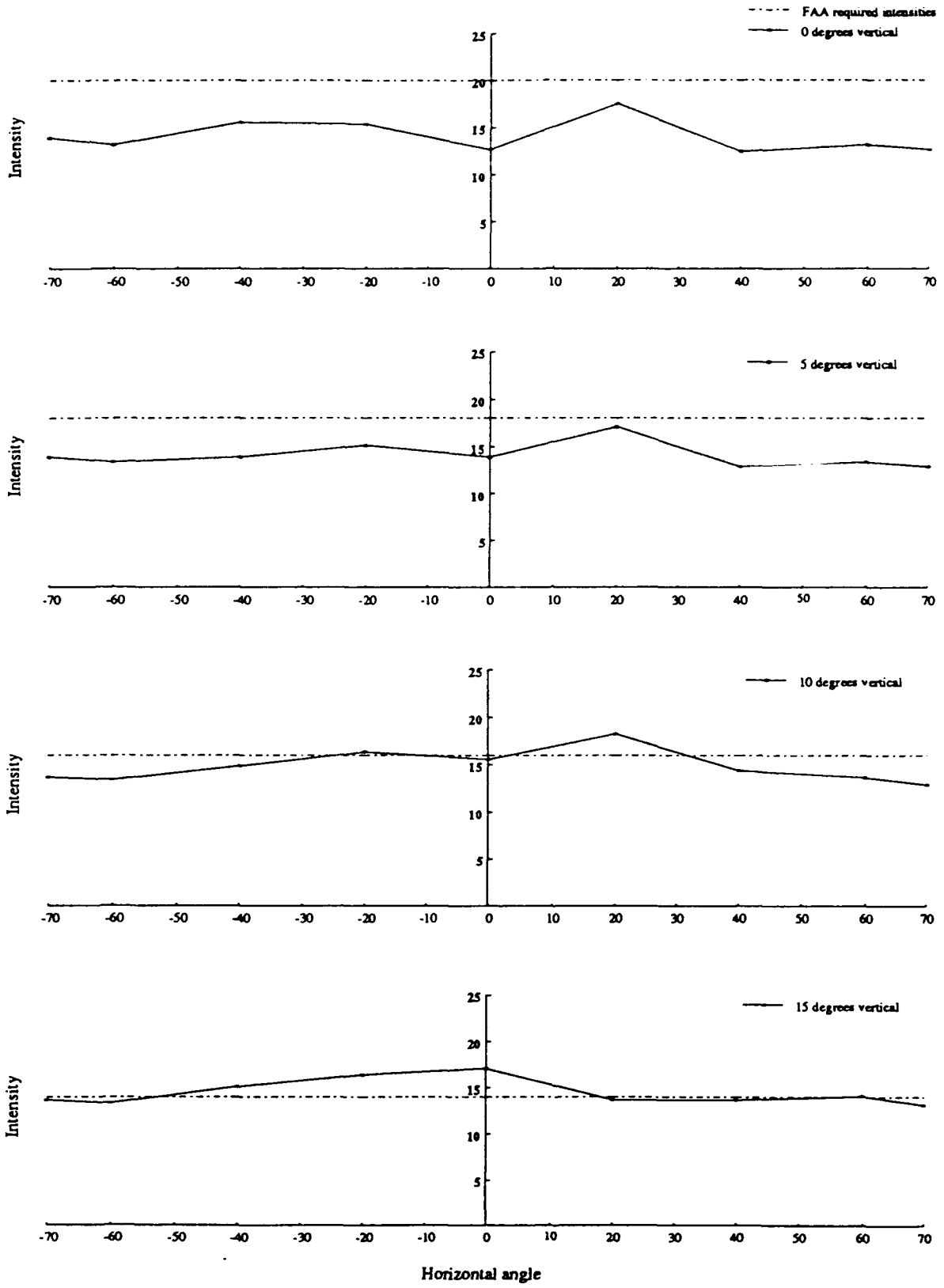

Figure I-2c. Intensity profiles for UH-1 unmasked tail position light in dim mode; bottom, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

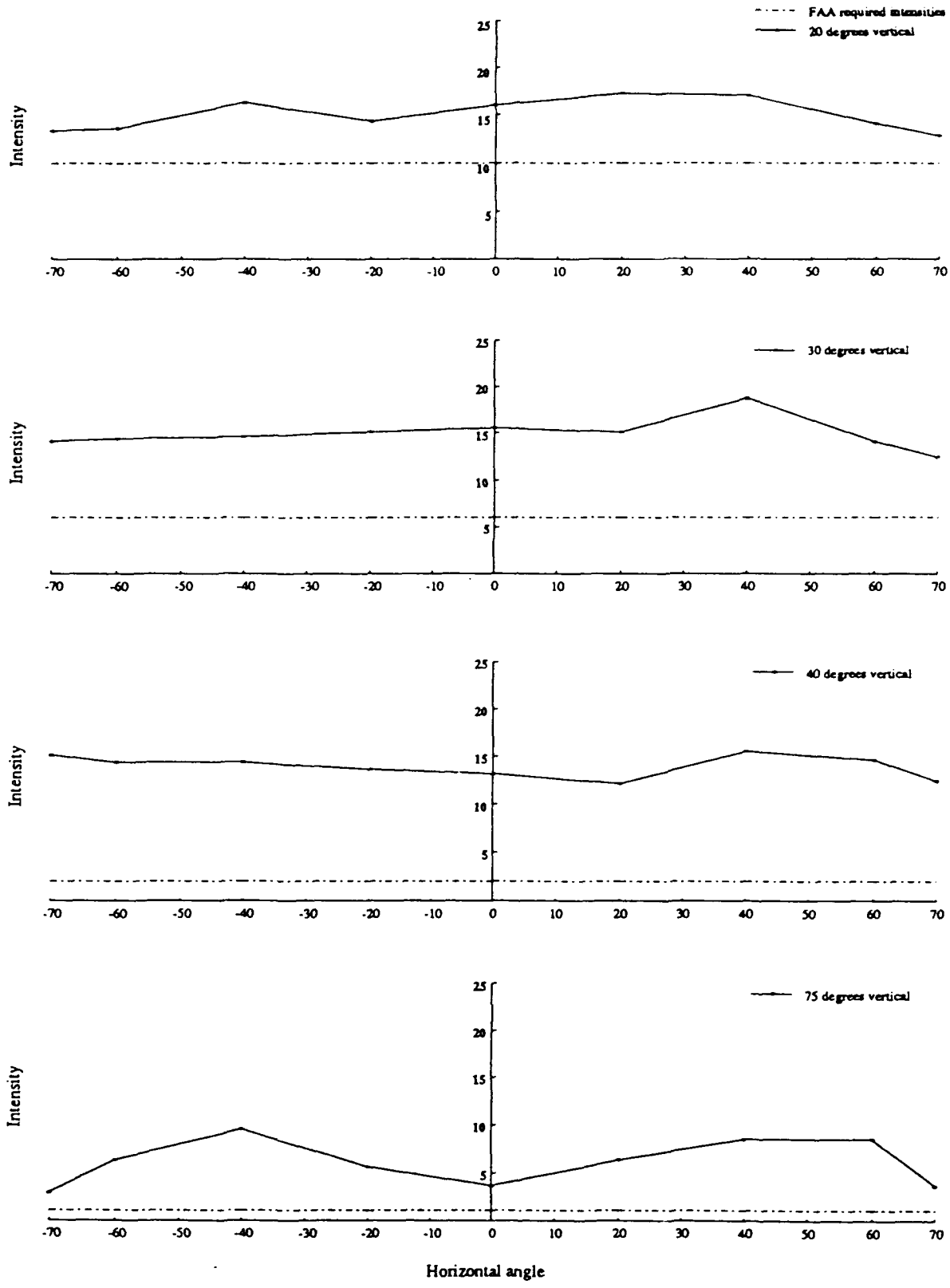

Figure I-2d. Intensity profiles for UH-1 unmasked tail position light in dim mode; bottom, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

Table I-1a.

Measured data and calculated intensity values for UH-1 tail position light, single samples; unmasked, bright. Intensity expressed in candelas.

UNMASKED/BRIGHT — Instrument readings — Nov. 23, 1992

		CW horizontal angle 0	20	40	60	70
v	0	128	150	126	125	130
e	5	136	143	111	124	130
r	10	138	143	115	127	131
t	15	148	167	129	128	136
	20	171	165	148	132	133
TOP	30	158	152	142	133	137
	40	128	133	141	127	147
	75	47	63	131	75	40
	90					

UNMASKED/BRIGHT — Instrument readings — Nov. 23, 1992

		CW horizontal angle 0	20	40	60	70
v	0	121	155	121	125	129
e	5	132	149	124	128	130
r	10	151	174	139	131	130
t	15	162	155	132	133	131
	20	153	143	163	136	132
BOT	30	147	142	178	136	128
	40	127	137	146	143	125
	75	34	63	89	101	47
	90					

candle power values — d= 15.6146'

		CW horizontal angle 0	20	40	60	70
v	0	31.21	36.57	30.72	30.48	31.70
e	5	33.16	34.87	27.06	30.23	31.70
r	10	33.65	34.87	28.04	30.96	31.94
t	15	36.08	40.72	31.45	31.21	33.16
	20	41.69	40.23	36.08	32.18	32.43
TOP	30	38.52	37.06	34.62	32.43	33.40
	40	31.21	32.43	34.38	30.96	35.84
	75	11.46	15.36	31.94	18.29	9.75
	90					

candle power values — d= 15.6146'

		CW horizontal angle 0	20	40	60	70
v	0	29.50	37.79	29.50	30.48	31.45
e	5	32.18	36.33	30.23	31.21	31.70
r	10	36.82	42.42	33.89	31.94	31.70
t	15	39.50	37.79	32.18	32.43	31.94
	20	37.30	34.87	39.74	33.16	32.18
BOT	30	35.84	34.62	43.40	33.16	31.21
	40	30.96	33.40	35.60	34.87	30.48
	75	8.29	15.36	21.70	24.63	11.46
	90					

Instrument readings — Nov. 23, 1992

		CCW horizontal angle 0	20	40	60	70
v	0	128	155	136	129	121
e	5	136	162	144	131	122
r	10	138	163	139	133	123
t	15	148	156	152	136	124
	20	171	152	145	142	123
TOP	30	158	139	150	134	119
	40	128	137	141	128	112
	75	47	76	107	51	36
	90					

Instrument readings — Nov. 23, 1992

		CCW horizontal angle 0	20	40	60	70
v	0	121	148	145	129	131
e	5	132	142	131	129	132
r	10	151	156	139	129	131
t	15	162	155	143	129	130
	20	153	140	152	130	130
BOT	30	147	143	136	138	135
	40	127	130	140	138	145
	75	34	54	100	64	29
	90					

candle power values — d= 15.6146'

		CCW horizontal angle 0	20	40	60	70
v	0	31.21	37.79	33.16	31.45	29.50
e	5	33.16	39.50	35.11	31.94	29.75
r	10	33.65	39.74	33.89	32.43	29.99
t	15	36.08	38.04	37.06	33.16	30.23
	20	41.69	37.06	35.35	34.62	29.99
TOP	30	38.52	33.89	36.57	32.67	29.01
	40	31.21	33.40	34.38	31.21	27.31
	75	11.46	18.53	26.09	12.43	8.78
	90					

candle power values — d= 15.6146'

		CCW horizontal angle 0	20	40	60	70
v	0	29.50	36.08	35.35	31.45	31.94
e	5	32.18	34.62	31.94	31.45	32.18
r	10	36.82	38.04	33.89	31.45	31.94
t	15	39.50	37.79	34.87	31.45	31.70
	20	37.30	34.13	37.06	31.70	31.70
BOT	30	35.84	34.87	33.16	33.65	32.92
	40	30.96	31.70	34.13	33.65	35.35
	75	8.29	13.17	24.38	15.60	7.07
	90					

Table I-1b.

Measured data and calculated intensity values for UH-1 tail position light, single samples; unmasked, dim. Intensity expressed in candelas.

UNMASKED/DIM — Dec. 4, 1992

Instrument readings — CW — horizontal angle

vertical angle	0	20	40	60	70
0	56	67	66	53	56
5	58	64	72	54	56
10	59	59	69	54	56
15	65	65	57	55	56
20	67	69	59	55	57
30	68	66	65	56	54
40	56	61	60	57	59
75	17	35	61	33	17
90					

(TOP: 30; BOT: 20)

d= 15.6146' — candle power values — CW — horizontal angle

vertical angle	0	20	40	60	70
0	13.65	16.34	16.09	12.92	13.65
5	14.14	15.60	17.55	13.17	13.65
10	14.39	14.39	16.82	13.17	13.65
15	15.85	15.85	13.90	13.41	13.65
20	16.34	16.82	14.39	13.41	13.90
30	16.58	16.09	15.85	13.65	13.17
40	13.65	14.87	14.63	13.90	14.39
75	4.14	8.53	14.87	8.05	4.14
90					

UNMASKED/DIM — Dec. 4, 1992

Instrument readings — CW — horizontal angle

vertical angle	0	20	40	60	70
0	52	72	51	54	52
5	57	70	53	55	53
10	64	75	59	56	53
15	70	56	56	58	54
20	66	71	70	58	53
30	64	62	77	58	51
40	54	50	64	60	51
75	15	26	35	35	15
90					

(BOT: 20)

d= 15.6146' — candle power values — CW — horizontal angle

vertical angle	0	20	40	60	70
0	12.68	17.55	12.43	13.17	12.68
5	13.90	17.07	12.92	13.41	12.92
10	15.60	18.29	14.39	13.65	12.92
15	17.07	13.65	13.65	14.14	13.17
20	16.09	17.31	17.07	14.14	12.92
30	15.60	15.12	18.77	14.14	12.43
40	13.17	12.19	15.60	14.63	12.43
75	3.66	6.34	8.53	8.53	3.66
90					

Instrument readings — CCW — horizontal angle — Dec. 4, 1992

vertical angle	0	20	40	60	70
0	56	64	59	57	55
5	58	64	63	58	55
10	59	72	64	58	54
15	65	74	60	58	54
20	67	73	65	58	53
30	68	60	62	60	52
40	56	55	59	57	54
75	17	24	41	23	14
90					

(TOP: 30)

d= 15.6146' — candle power values — CCW — horizontal angle

vertical angle	0	20	40	60	70
0	13.65	15.60	14.39	13.90	13.41
5	14.14	15.60	15.36	14.14	13.41
10	14.39	17.55	15.60	14.14	13.17
15	15.85	18.04	14.63	14.14	13.17
20	16.34	17.80	15.85	14.14	12.92
30	16.58	14.63	15.12	14.63	12.68
40	13.65	13.41	14.39	13.90	13.17
75	4.14	5.85	10.00	5.61	3.41
90					

Instrument readings — CCW — horizontal angle — Dec. 4, 1992

vertical angle	0	20	40	60	70
0	52	63	64	54	57
5	57	62	57	55	57
10	64	67	61	55	56
15	70	67	62	55	56
20	66	59	67	56	55
30	64	62	60	59	58
40	54	56	59	59	62
75	15	23	39	26	12
90					

(BOT: 20)

d= 15.6146' — candle power values — CCW — horizontal angle

vertical angle	0	20	40	60	70
0	12.68	15.36	15.60	13.17	13.90
5	13.90	15.12	13.90	13.41	13.90
10	15.60	16.34	14.87	13.41	13.65
15	17.07	16.34	15.12	13.41	13.65
20	16.09	14.39	16.34	13.65	13.41
30	15.60	15.12	14.63	14.39	14.14
40	13.17	13.65	14.39	14.39	15.12
75	3.66	5.61	9.51	6.34	2.93
90					

Appendix J.

Intensity profiles, illuminance measurements, and calculated intensities for UH-60 tail position light.

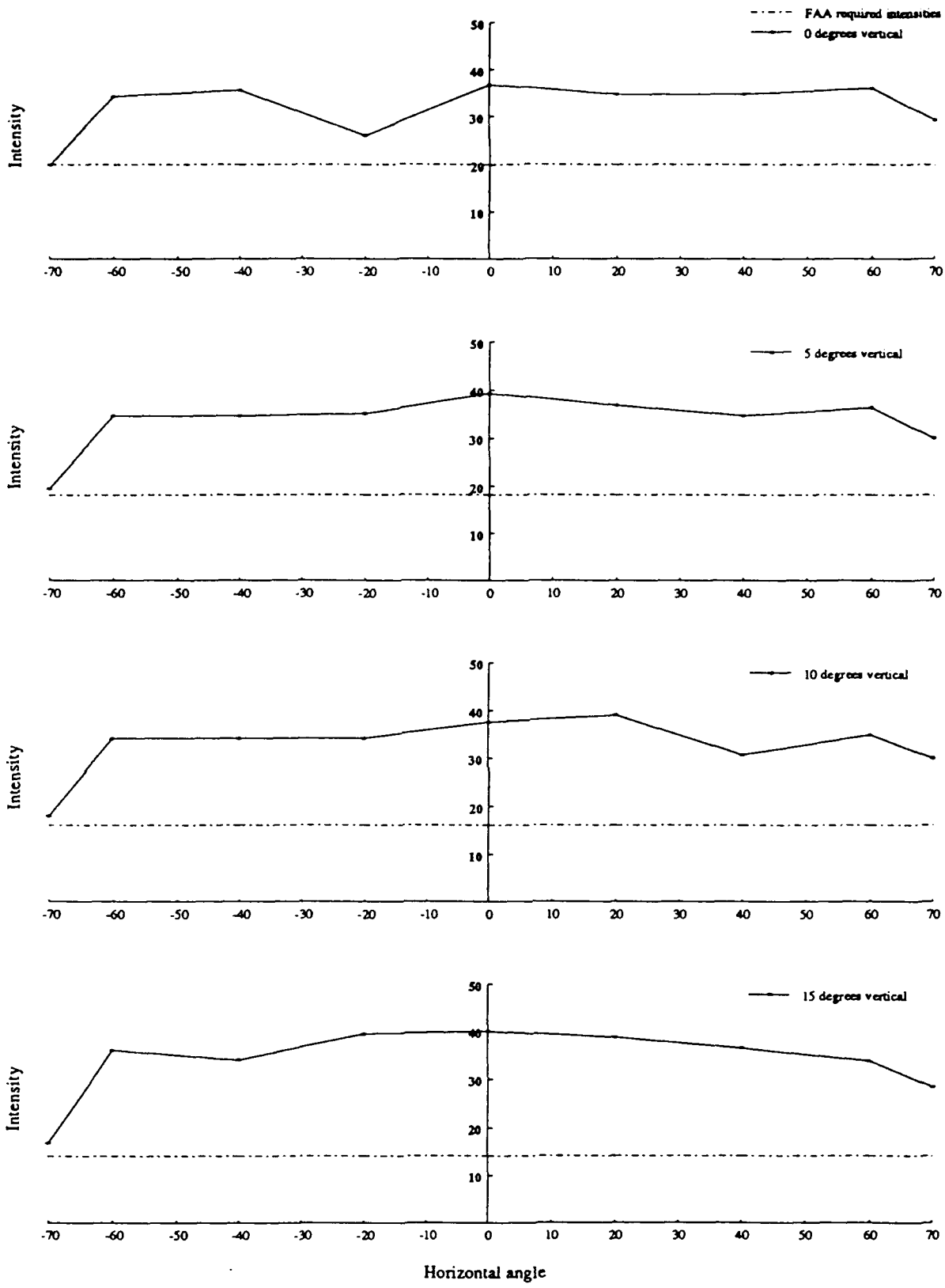

Figure J-1a. Intensity profiles for UH-60 unmasked tail position light in bright mode; top, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

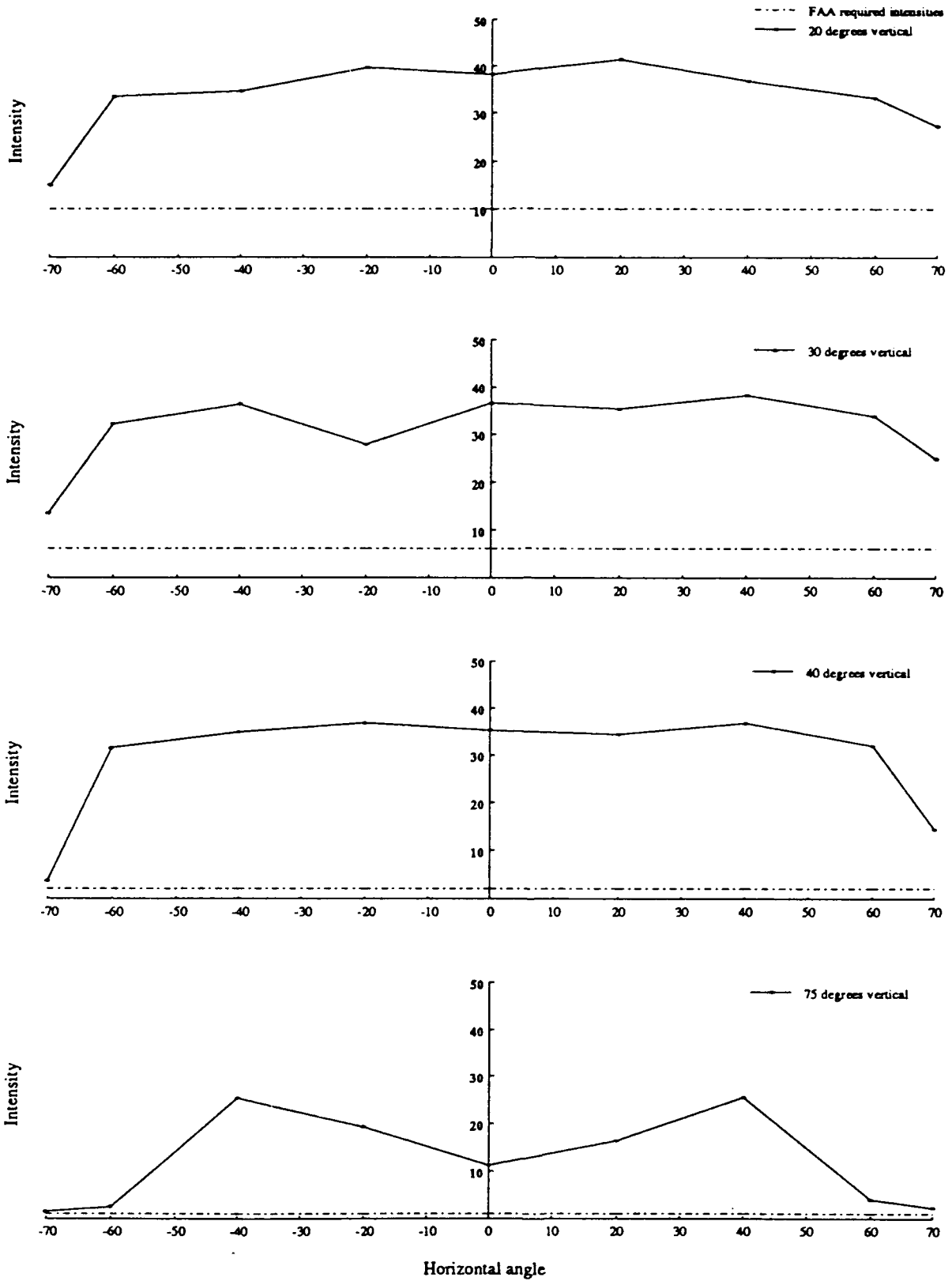

Figure J-1b. Intensity profiles for UH-60 unmasked tail position light in bright mode; top, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

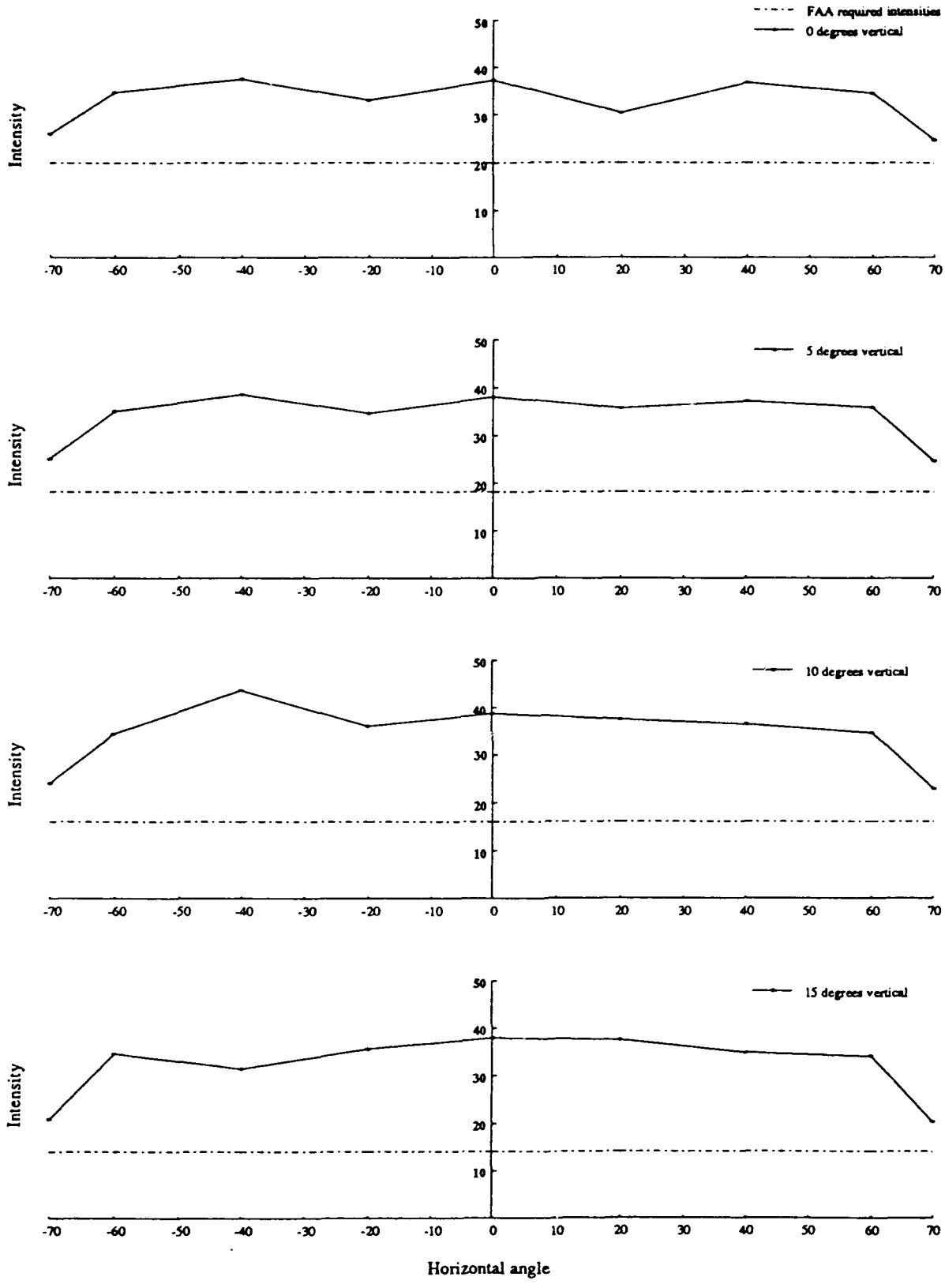

Figure J-1c. Intensity profiles for UH-60 unmasked tail position light in bright mode; bottom, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

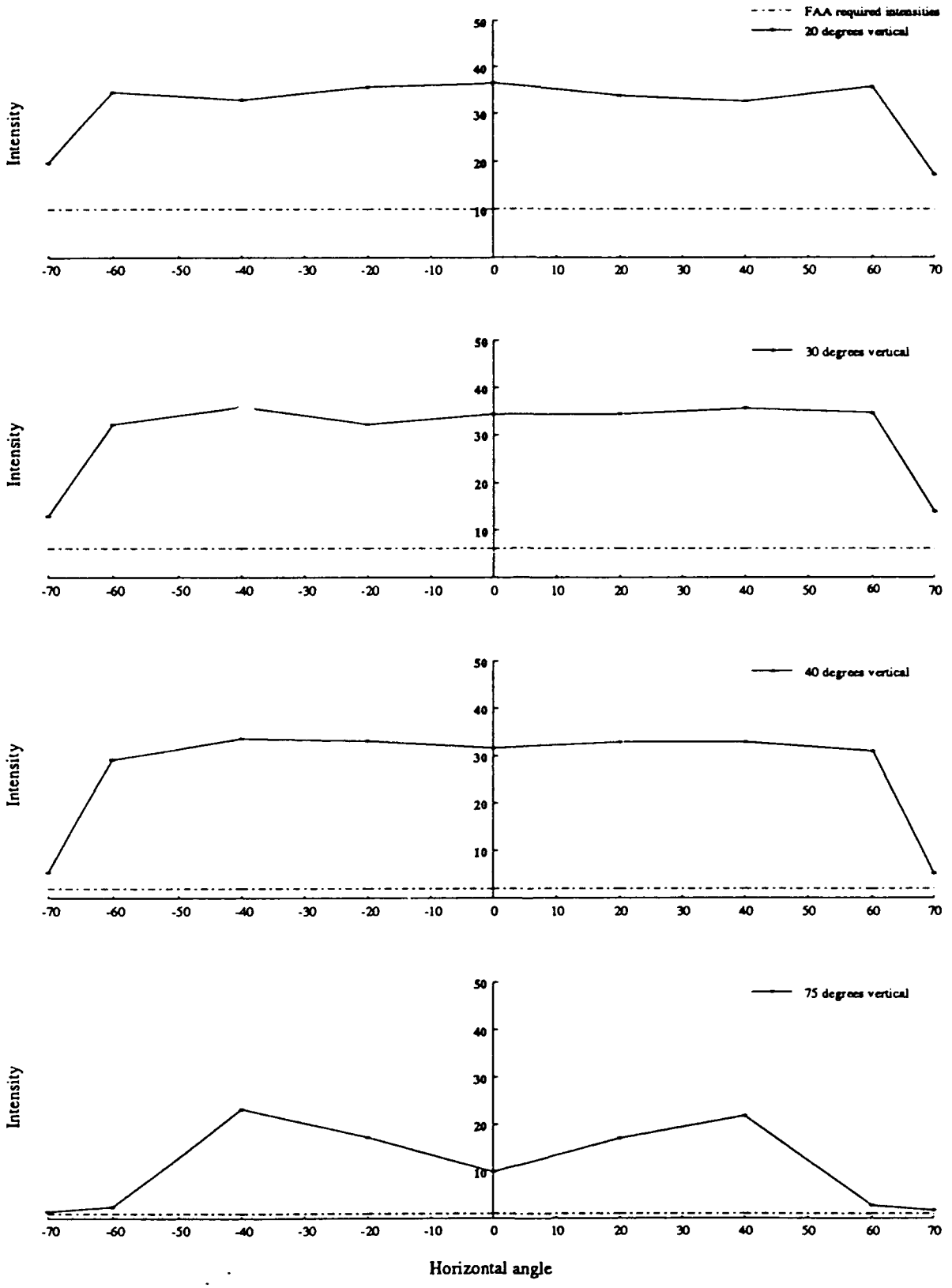

Figure J-1d. Intensity profiles for UH-60 unmasked tail position light in bright mode; bottom, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

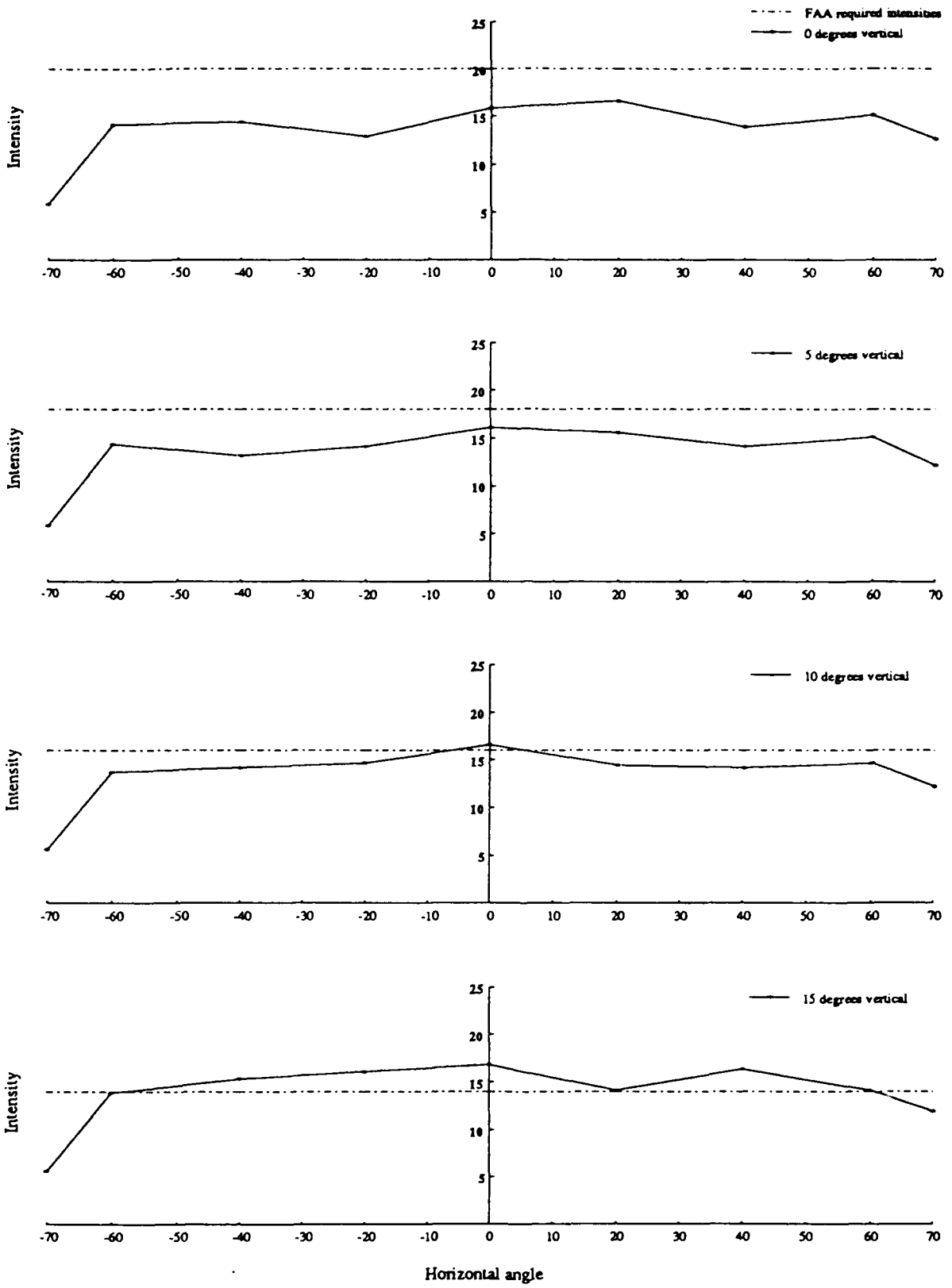

Figure J-2a. Intensity profiles for UH-60 unmasked tail position light in dim mode; top, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

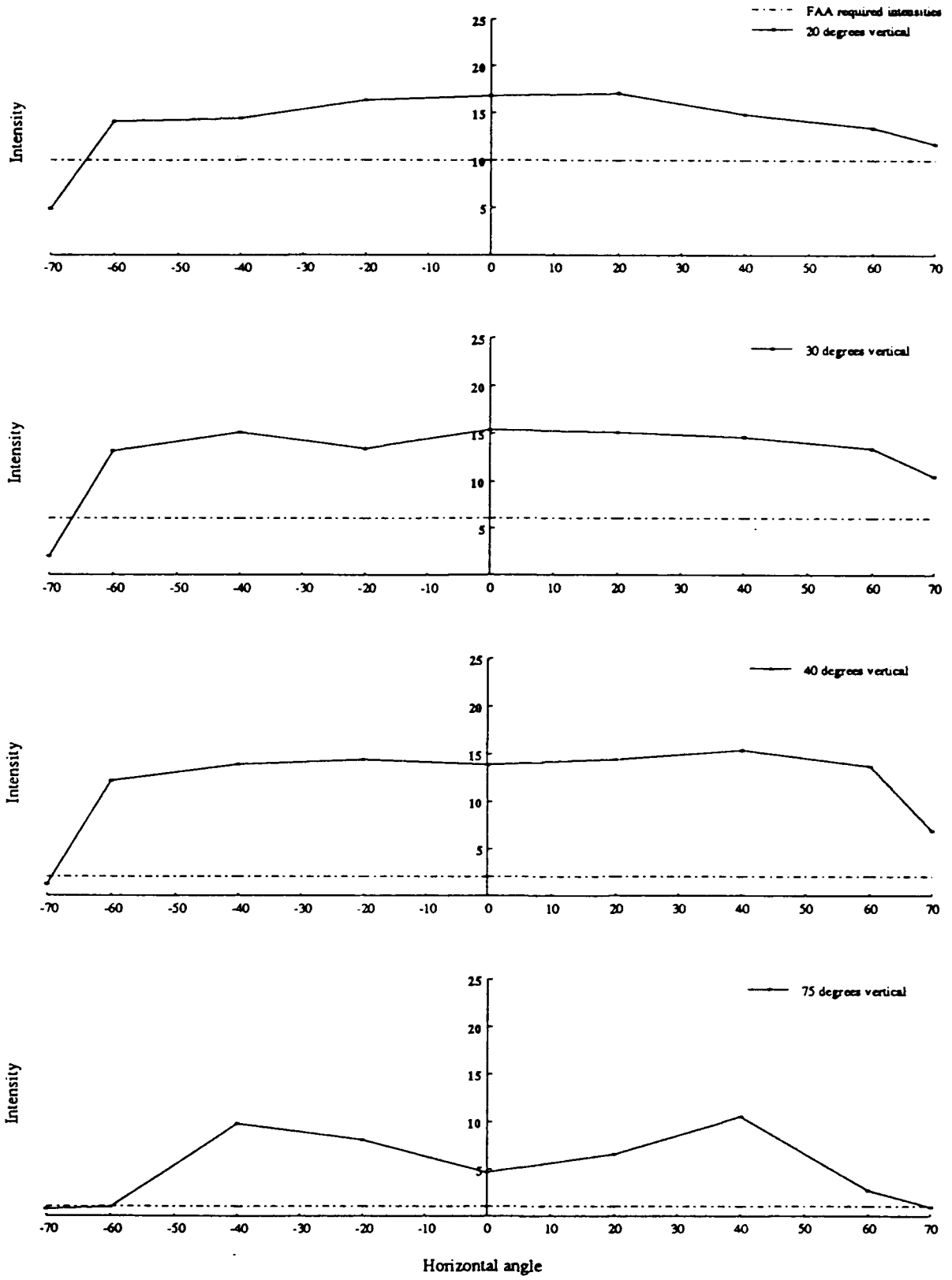

Figure J-2b. Intensity profiles for UH-60 unmasked tail position light in dim mode; top, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

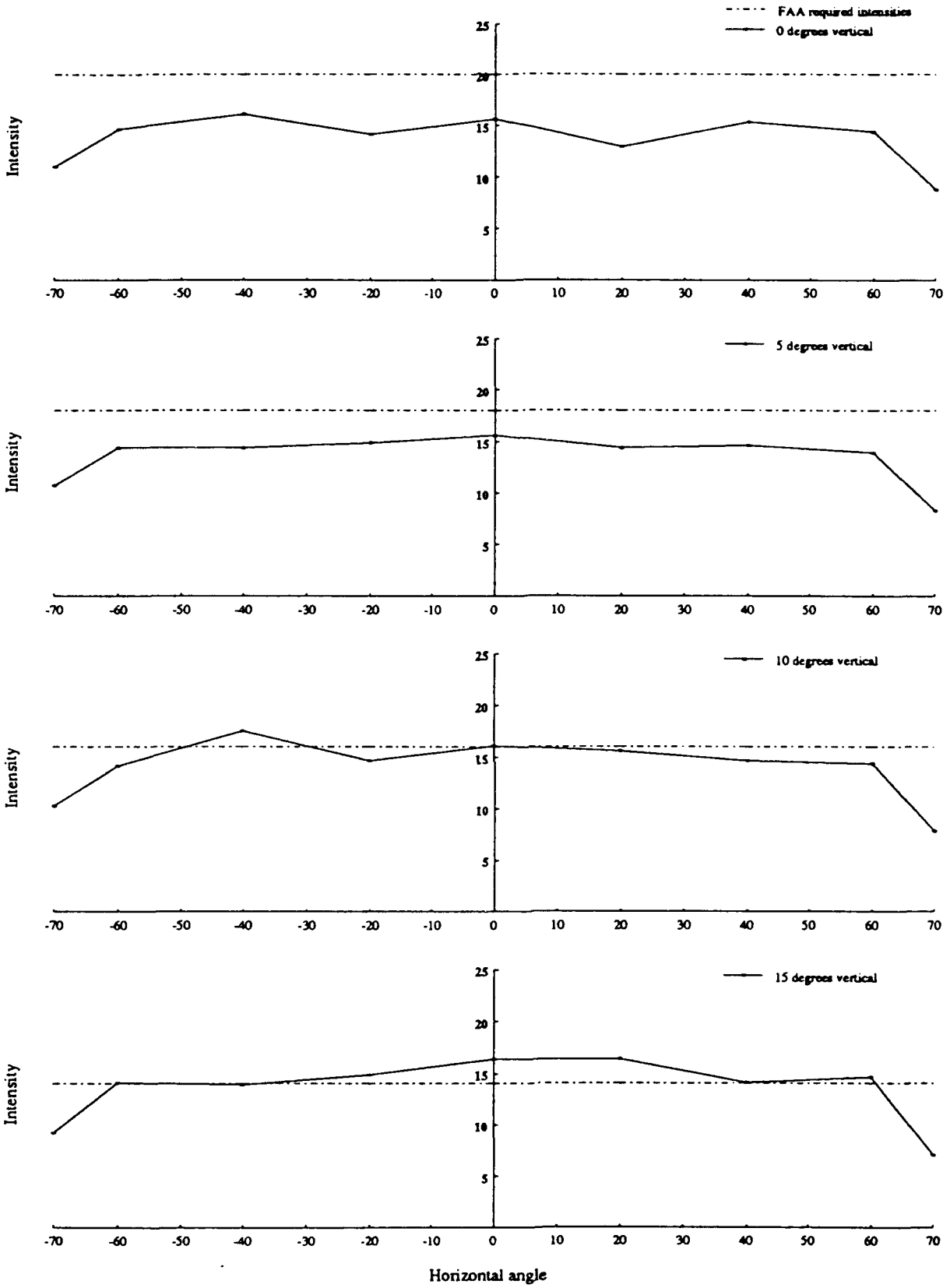

Figure J-2c. Intensity profiles for UH-60 unmasked tail position light in dim mode; bottom, vertical angles 0 to 15 degrees. Intensity expressed in candelas.

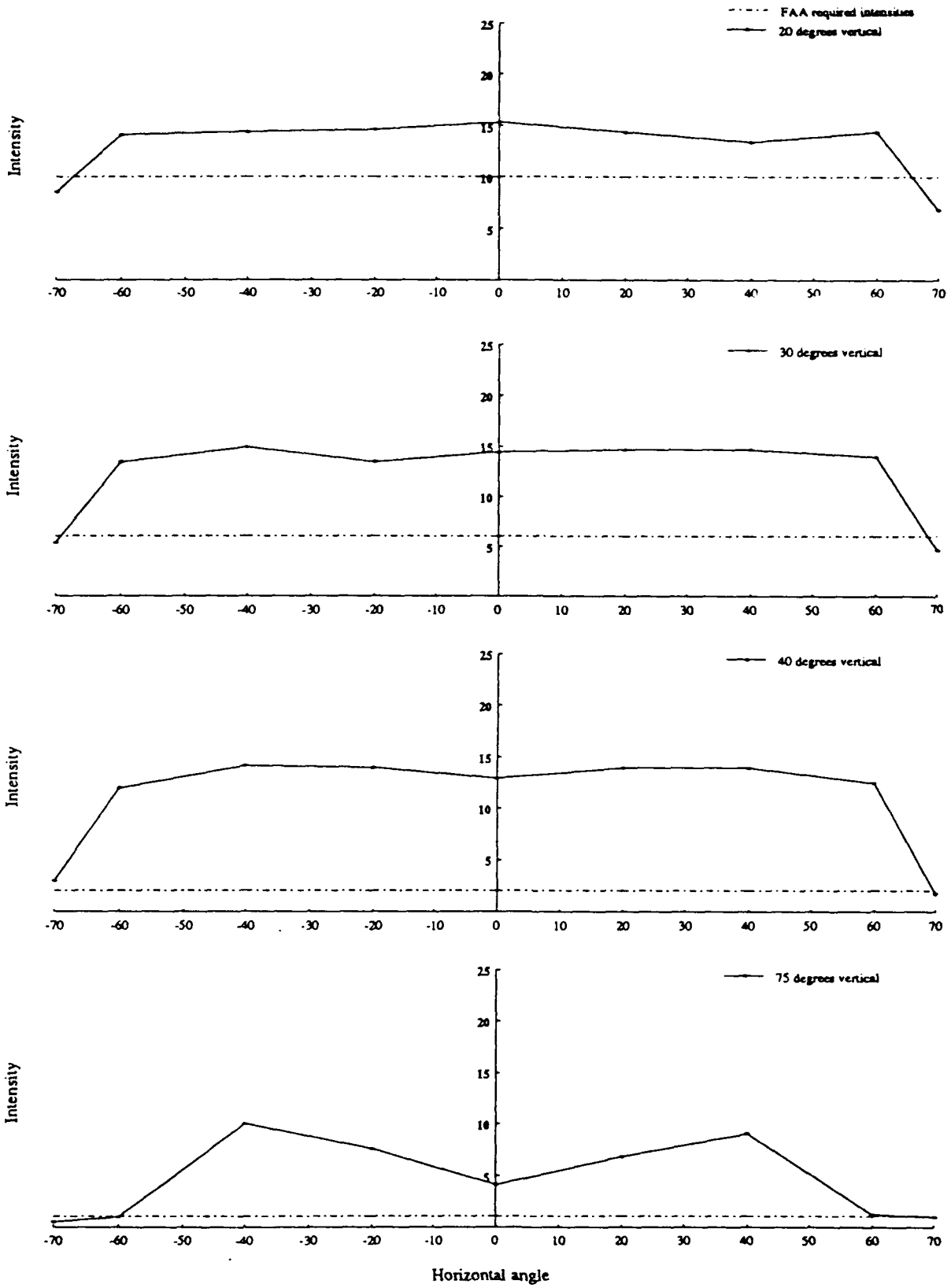

Figure J-2d. Intensity profiles for UH-60 unmasked tail position light in dim mode; bottom, vertical angles 20 to 75 degrees. Intensity expressed in candelas.

Table J-1a.

Measured data and calculated intensity values for UH-60 tail position light, single samples; unmasked, bright. Intensity expressed in candelas.

UNMASKED/BRIGHT — Instrument readings — 18 Nov. 1992

		CW horizontal angle 0	20	40	60	70
v	0	151	143	143	148	121
e	5	161	151	142	149	123
r	10	154	160	126	143	123
t	15	164	159	150	139	117
	20	157	170	151	136	112
TOP	30	150	145	157	139	102
	40	145	141	151	131	59
	75	46	67	105	16	9
	90					

UNMASKED/BRIGHT — Instrument readings — 18 Nov. 1992

		CW horizontal angle 0	20	40	60	70
v	0	153	125	151	142	102
e	5	156	146	152	147	101
r	10	159	154	150	142	94
t	15	156	154	143	140	83
	20	150	139	134	146	71
BOT	30	141	141	146	142	57
	40	130	135	135	127	21
	75	41	70	89	11	7
	90					

d= 15.6146' — candle power values

		CW horizontal angle 0	20	40	60	70
v	0	36.82	34.87	34.87	36.08	29.50
e	5	39.25	36.82	34.62	36.33	29.99
r	10	37.55	39.01	30.72	34.87	29.99
t	15	39.99	38.77	36.57	33.89	28.53
	20	38.28	41.45	36.82	33.16	27.31
TOP	30	36.57	35.35	38.28	33.89	24.87
	40	35.35	34.38	36.82	31.94	14.39
	75	11.22	16.34	25.60	3.90	2.19
	90					

d= 15.6146' — candle power values

		CW horizontal angle 0	20	40	60	70
v	0	37.30	30.46	36.82	34.62	24.87
e	5	38.04	35.60	37.06	35.84	24.63
r	10	38.77	37.55	36.57	34.62	22.92
t	15	38.04	37.55	34.87	34.13	20.24
	20	36.57	33.89	32.67	35.60	17.31
BOT	30	34.38	34.38	35.60	34.62	13.90
	40	31.70	32.92	32.92	30.96	5.12
	75	10.00	17.07	21.70	2.68	1.71
	90					

Instrument readings — 18 Nov. 1992

		CCW horizontal angle 0	20	40	60	70
v	0	151	107	146	141	82
e	5	161	144	142	142	80
r	10	154	140	140	140	74
t	15	164	162	140	148	69
	20	157	163	142	138	61
TOP	30	150	114	149	132	55
	40	145	151	143	129	15
	75	46	79	104	10	6
	90					

Instrument readings — 18 Nov. 1992

		CCW horizontal angle 0	20	40	60	70
v	0	153	136	154	143	107
e	5	156	142	158	144	103
r	10	159	148	179	141	99
t	15	156	146	129	142	86
	20	150	146	135	142	81
BOT	30	141	132	147	132	53
	40	130	136	138	120	22
	75	41	71	95	10	6
	90					

d= 15.6146' — candle power values

		CCW horizontal angle 0	20	40	60	70
v	0	36.82	26.09	35.60	34.38	19.99
e	5	39.25	35.11	34.62	34.62	19.51
r	10	37.55	34.13	34.13	34.13	18.04
t	15	39.99	39.50	34.13	36.08	16.82
	20	38.28	39.74	34.62	33.65	14.87
TOP	30	36.57	27.79	36.33	32.18	13.41
	40	35.35	36.82	34.87	31.45	3.66
	75	11.22	19.26	25.36	2.44	1.46
	90					

d= 15.6146' — candle power values

		CCW horizontal angle 0	20	40	60	70
v	0	37.30	33.16	37.55	34.87	26.09
e	5	38.04	34.62	38.52	35.11	25.11
r	10	38.77	36.08	43.64	34.38	24.14
t	15	38.04	35.60	31.45	34.62	20.97
	20	36.57	35.60	32.92	34.62	19.75
BOT	30	34.38	32.18	35.84	32.18	12.92
	40	31.70	33.16	33.65	29.26	5.36
	75	10.00	17.31	23.16	2.44	1.46
	90					

Table J-1b.

Measured data and calculated intensity values for UH-60 tail position light, single samples; unmasked, dim. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 7 Dec. 1992

		CW 0	20	40	60	70
v	0	65	68	57	62	52
e	5	66	64	58	62	50
r	10	68	59	58	60	50
t	15	69	58	67	58	49
	20	69	70	61	55	48
TOP	30	63	62	60	55	43
	40	57	59	63	56	28
	75	19	27	43	11	4
	90					

d= 15.6146' — candle power values

		CW 0	20	40	60	70
v	0	15.85	16.58	13.90	15.12	12.68
e	5	16.09	15.60	14.14	15.12	12.19
r	10	16.58	14.39	14.14	14.63	12.19
t	15	16.82	14.14	16.34	14.14	11.95
	20	16.82	17.07	14.87	13.41	11.70
TOP	30	15.36	15.12	14.63	13.41	10.48
	40	13.90	14.39	15.36	13.65	6.83
	75	4.63	6.58	10.48	2.68	0.98
	90					

UNMASKED/DIM — Instrument readings — 7 Dec. 1992

		CW 0	20	40	60	70
v	0	64	53	63	59	36
e	5	64	59	60	57	34
r	10	66	64	60	54	32
t	15	67	67	58	60	29
	20	63	59	55	59	28
BOT	30	59	60	60	52	19
	40	53	57	57	54	7
	75	17	28	37	5	4
	90					

d= 15.6146' — candle power values

		CW 0	20	40	60	70
v	0	15.60	12.92	15.36	14.39	8.78
e	5	15.60	14.39	14.63	13.90	8.29
r	10	16.09	15.60	14.63	14.39	7.80
t	15	16.34	16.34	14.14	14.63	7.07
	20	15.36	14.39	13.41	14.39	6.83
BOT	30	14.39	14.63	14.63	13.90	4.63
	40	12.92	13.90	13.90	12.43	1.71
	75	4.14	6.83	9.02	1.22	0.98
	90					

Instrument readings — 7 Dec. 1992

		CCW 0	20	40	60	70
v	0	65	53	59	58	24
e	5	66	58	54	59	24
r	10	68	60	58	56	23
t	15	69	66	63	57	23
	20	69	67	59	58	20
TOP	30	63	55	62	54	8
	40	57	59	57	50	5
	75	19	33	40	4	3
	90					

d= 15.6146' — candle power values

		CCW 0	20	40	60	70
v	0	15.85	12.92	14.39	14.14	5.85
e	5	16.09	14.14	13.17	14.39	5.85
r	10	16.58	14.63	14.14	13.65	5.61
t	15	16.82	16.09	15.36	13.90	5.61
	20	16.82	16.34	14.39	14.14	4.88
TOP	30	15.36	13.41	15.12	13.17	1.95
	40	13.90	14.39	13.90	12.19	1.22
	75	4.63	8.05	9.75	0.98	0.73
	90					

Instrument readings — 7 Dec. 1992

		CCW 0	20	40	60	70
v	0	64	58	66	60	45
e	5	64	61	59	59	44
r	10	66	60	72	58	42
t	15	67	61	57	58	38
	20	63	60	59	58	35
BOT	30	59	55	61	55	22
	40	53	57	58	49	12
	75	17	31	41	4	2
	90					

d= 15.6146' — candle power values

		CCW 0	20	40	60	70
v	0	15.60	14.14	16.09	14.63	10.97
e	5	15.60	14.87	14.39	14.39	10.73
r	10	16.09	14.63	17.55	14.14	10.24
t	15	16.34	14.87	13.90	14.14	9.26
	20	15.36	14.63	14.39	14.14	8.53
BOT	30	14.39	13.41	14.87	13.41	5.36
	40	12.92	13.90	14.14	11.95	2.93
	75	4.14	7.56	10.00	0.98	0.49
	90					

Appendix K.

Measured illuminance and calculated intensity data for 14 samples of Type II reflector lateral position light bulb used in the OH-58D/UH-60 fixture in dim mode with an unmasked, red dome configuration.

Table K-1a.

Measured data and calculated intensity values for type II lateral position light bulb, multiple samples; bulbs #1 and 2. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 19 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	112	127	133	139	109	34	24	29	27	12
e	5	130	133	103	124	127	33	24	28	26	13
r	10	87	107	78	95	108	32	24	27	23	15
t	15	93	108	77	100	105	30	23	26	22	16
	20	96	120	94	111	109	27	23	25	21	16
TOP	30	63	129	73	68	66	28	24	23	22	16
	40	27	44	32	30	30	26	28	23	24	19
	75	17	23	22	24	23	22	31	21	29	25
	90										

candle power values — d=13.90625'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	28.34	32.13	33.65	35.17	27.58	8.60	6.07	7.34	6.83	3.04
e	5	32.89	33.65	26.06	31.37	32.13	8.35	6.07	7.08	6.58	3.29
r	10	22.01	27.07	19.73	24.04	27.32	8.10	6.07	6.83	5.82	3.80
t	15	23.53	27.32	19.48	25.30	26.57	7.59	5.82	6.58	5.57	4.05
	20	24.29	30.36	23.78	28.08	27.58	6.83	5.82	6.33	5.31	4.05
TOP	30	15.94	32.64	18.47	17.20	16.70	7.08	6.07	5.82	5.57	4.05
	40	6.83	11.13	8.10	7.59	7.59	6.58	7.08	5.82	6.07	4.81
	75	4.30	5.82	5.57	6.07	5.82	5.57	7.84	5.31	7.34	6.33
	90										

UNMASKED/DIM — Instrument readings — 20 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	136	146	100	119	134	35	28	30	16	7
e	5	102	125	78	97	121	32	27	30	17	8
r	10	97	123	81	105	125	28	27	29	17	7
t	15	90	135	100	113	116	27	26	29	18	8
	20	69	163	100	97	98	27	27	28	19	9
TOP	30	46	99	56	52	49	29	31	29	20	12
	40	24	32	32	32	29	28	36	28	22	17
	75	19	29	27	30	27	32	32	22	31	24
	90										

candle power values — d=15.77083'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	33.83	36.31	24.87	29.60	33.33	8.71	6.96	7.46	3.98	1.74
e	5	25.37	31.09	19.40	24.13	30.10	7.96	6.72	7.46	4.23	1.99
r	10	24.13	30.59	20.15	26.12	31.09	6.96	6.72	7.21	4.23	1.74
t	15	22.38	33.58	24.87	28.11	28.85	6.72	6.47	7.21	4.48	1.99
	20	17.16	40.54	24.87	24.13	24.37	6.72	6.72	6.96	4.73	2.24
TOP	30	11.44	24.62	13.93	12.93	12.19	7.21	7.71	7.21	4.97	2.98
	40	5.97	7.96	7.96	7.96	7.21	6.96	8.95	6.96	5.47	4.23
	75	4.73	7.21	6.72	7.46	6.72	7.96	7.96	5.47	7.71	5.97
	90										

UNMASKED/DIM — Instrument readings — 19 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	153	149	107	122	131	38	28	26	23	7
e	5	124	142	139	144	117	38	29	26	23	7
r	10	90	144	120	120	104	39	29	26	23	7
t	15	71	184	113	121	103	40	30	27	23	7
	20	53	181	95	95	79	38	29	28	23	7
BTM	30	24	72	40	39	45	30	28	31	24	6
	40	17	27	22	24	31	33	28	33	27	15
	75	34	27	20	24	22	27	30	38	25	19
	90										

candle power values — d=13.90625'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	38.71	37.70	27.07	30.87	33.14	9.61	7.08	6.58	5.82	1.77
e	5	31.37	35.93	35.17	36.43	29.60	9.61	7.34	6.58	5.82	1.77
r	10	22.77	36.43	30.36	30.36	26.31	9.87	7.34	6.58	5.82	1.77
t	15	17.96	46.55	28.59	30.61	26.06	10.12	7.59	6.83	5.82	1.77
	20	13.92	45.79	24.04	24.04	19.99	9.61	7.34	7.08	5.82	1.77
BTM	30	6.07	18.22	10.12	9.87	11.39	7.59	7.08	7.84	6.07	1.52
	40	4.30	6.83	5.57	6.07	7.84	8.10	7.08	8.35	6.83	3.80
	75	8.60	6.83	5.06	6.07	5.57	6.83	7.59	9.61	6.33	4.81
	90										

UNMASKED/DIM — Instrument readings — 20 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	90	168	126	119	128	36	26	28	15	7
e	5	69	138	133	125	117	38	27	29	15	8
r	10	53	150	118	112	112	39	27	30	15	9
t	15	44	186	107	113	97	37	26	32	16	11
	20	37	180	93	92	76	32	26	34	15	11
BTM	30	19	66	43	42	46	28	27	37	18	16
	40	18	30	30	25	30	30	26	41	18	22
	75	20	37	34	27	22	27	34	39	21	32
	90										

candle power values — d=15.75'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	22.33	41.67	31.26	29.52	31.75	8.93	6.45	6.95	3.72	1.74
e	5	17.12	34.23	32.99	31.01	29.02	9.43	6.70	7.19	3.72	1.98
r	10	13.15	37.21	29.27	27.78	27.78	9.67	6.70	7.44	3.72	2.23
t	15	10.91	46.14	26.54	28.03	24.06	9.18	6.45	7.94	3.97	2.73
	20	9.18	44.65	23.07	22.82	18.85	7.94	6.45	8.43	3.72	2.73
BTM	30	4.71	16.37	10.67	10.42	11.41	6.95	6.70	9.18	4.47	3.97
	40	4.47	7.44	7.44	6.20	7.44	7.44	6.45	10.17	4.47	5.46
	75	4.96	9.18	8.43	6.70	5.46	6.70	8.43	9.67	5.21	7.94
	90										

Table K-1b.

Measured data and calculated intensity values for type II lateral position light bulb, multiple samples; bulbs #3 and 4. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 21 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	137	123	106	116	138	30	26	24	25	7
e	5	109	111	87	96	121	29	25	24	26	7
r	10	105	105	88	105	130	27	25	23	28	7
t	15	111	108	100	117	143	28	25	23	26	8
	20	107	123	93	93	107	30	26	22	26	9
TOP	30	92	78	55	51	44	31	29	23	24	13
	40	26	29	29	30	28	28	33	24	26	18
	75	22	28	27	30	31	32	31	26	34	25
	90										

candle power values — d=15.71875

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	33.85	30.39	26.19	28.66	34.10	7.41	6.42	5.93	6.18	1.73
e	5	26.93	27.43	21.50	23.72	29.90	7.17	6.18	5.93	6.42	1.73
r	10	25.94	25.94	21.74	25.94	32.12	6.67	6.18	5.68	6.92	1.73
t	15	27.43	26.68	24.71	28.91	35.33	6.92	6.18	5.68	6.42	1.98
	20	26.44	30.39	22.98	22.98	26.44	7.41	6.42	5.44	6.42	2.22
TOP	30	22.73	19.27	13.59	12.60	10.87	7.66	7.17	5.68	5.93	3.21
	40	6.42	7.17	7.17	7.41	6.92	6.92	8.15	5.93	6.42	4.45
	75	5.44	6.92	6.67	7.41	7.66	7.91	7.66	6.42	8.40	6.18
	90										

Instrument readings — 21 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	104	155	131	131	130	33	25	25	23	14
e	5	90	136	133	148	112	36	25	25	22	15
r	10	90	135	119	124	105	40	26	25	21	15
t	15	99	166	117	125	108	41	26	26	21	16
	20	79	181	105	103	83	34	25	28	20	16
BTM	30	26	100	52	47	48	28	24	32	22	19
	40	21	35	52	27	30	28	23	36	24	23
	75	19	54	22	22	22	19	25	40	22	32
	90										

candle power values — d=15.73958

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	25.76	38.40	32.45	32.45	32.21	8.18	6.19	6.19	5.70	3.47
e	5	22.30	33.69	32.95	36.66	27.75	8.92	6.19	6.19	5.45	3.72
r	10	22.30	33.44	29.48	30.72	26.01	9.91	6.44	6.19	5.20	3.72
t	15	24.53	41.12	28.98	30.97	26.76	10.16	6.44	6.44	5.20	3.96
	20	19.57	44.84	26.01	25.52	20.56	8.42	6.19	6.94	4.95	3.96
BTM	30	6.44	24.77	12.88	11.64	11.89	6.94	5.95	7.93	5.45	4.71
	40	5.20	8.67	12.88	8.69	7.43	6.94	5.70	8.92	5.95	5.70
	75	4.71	13.38	5.45	5.45	5.45	4.71	6.19	9.91	5.45	7.93
	90										

UNMASKED/DIM — Instrument readings — 22 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	143	147	123	150	126	32	26	25	22	11
e	5	97	127	92	128	100	27	25	24	24	13
r	10	97	128	100	144	89	24	25	23	25	14
t	15	98	153	130	123	81	24	25	23	26	15
	20	87	159	99	70	70	25	26	22	27	17
TOP	30	38	44	41	36	31	28	29	22	29	15
	40	22	28	28	26	24	26	30	22	34	22
	75	19	25	23	25	28	31	32	20	29	22
	90										

candle power values — d=15.75

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	35.47	36.47	30.51	37.21	31.26	7.94	6.45	6.20	5.46	2.73
e	5	24.06	31.50	22.82	31.75	24.81	6.70	6.20	5.95	5.95	3.22
r	10	24.06	31.75	24.81	35.72	22.08	5.95	6.20	5.71	6.20	3.47
t	15	24.31	37.95	32.25	30.51	20.09	5.95	6.20	5.71	6.45	3.72
	20	21.58	39.44	24.56	17.36	17.36	6.20	6.45	5.46	6.70	4.22
TOP	30	9.43	10.91	10.17	8.93	7.69	6.95	7.19	5.46	7.19	3.72
	40	5.46	6.95	6.95	6.45	5.95	6.45	7.44	5.46	8.43	5.46
	75	4.71	6.20	5.71	6.20	6.95	7.69	7.94	4.96	7.19	5.46
	90										

Instrument readings — 22 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	159	149	146	147	119	32	25	24	16	9
e	5	138	142	183	117	105	37	24	26	16	9
r	10	135	142	155	118	86	38	23	27	16	10
t	15	137	147	144	101	78	35	22	28	18	11
	20	124	124	98	77	74	31	21	30	17	12
BTM	30	54	46	44	40	48	30	19	33	19	15
	40	20	29	24	25	28	30	21	36	23	20
	75	36	29	21	19	22	23	25	38	19	23
	90										

candle power values — d=15.75

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	39.44	36.96	36.22	36.47	29.52	7.94	6.20	5.95	3.97	2.23
e	5	34.23	35.22	45.40	29.02	26.05	9.18	5.95	6.45	3.97	2.23
r	10	33.49	35.22	38.45	29.27	21.33	9.43	5.71	6.70	3.97	2.48
t	15	33.98	36.47	35.72	25.05	19.35	8.68	5.46	6.95	4.47	2.73
	20	30.76	30.76	24.31	19.10	18.36	7.69	5.21	7.44	4.22	2.98
BTM	30	13.40	11.41	10.91	9.92	11.91	7.44	4.71	8.19	4.71	3.72
	40	4.96	7.19	5.95	6.20	6.95	7.44	5.21	8.93	5.71	4.96
	75	8.93	7.19	5.21	4.71	5.46	5.71	6.20	9.43	4.71	5.71
	90										

Table K-1c.

Measured data and calculated intensity values for type II lateral position light bulb, multiple samples; bulbs #5 and 6. Intensity expressed in candelas.

UNMASKED/DIM — instrument readings — 25 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	93	123	96	110	120	30	26	27	18	12
e	5	89	100	79	89	103	27	25	26	18	13
r	10	91	96	80	98	108	26	25	26	20	14
t	15	90	107	95	110	109	26	25	27	21	14
	20	83	117	85	82	79	27	25	27	22	16
TOP	30	56	61	43	44	35	29	30	26	29	18
	40	21	28	29	28	26	28	33	26	35	23
	75	22	30	29	30	29	32	32	26	34	28
	90										

candle power values — d=15.75'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	23.07	30.51	23.81	27.29	29.77	7.44	6.45	6.70	4.47	2.98
e	5	22.08	24.81	19.60	22.08	25.55	6.70	6.20	6.45	4.47	3.22
r	10	22.57	23.81	19.85	24.31	26.79	6.45	6.20	6.45	4.96	3.47
t	15	22.33	26.54	23.57	27.29	27.04	6.45	6.20	6.70	5.21	3.47
	20	20.59	29.02	21.09	20.34	19.60	6.70	6.20	6.70	5.46	3.97
TOP	30	13.89	15.13	10.67	10.91	8.68	7.19	7.44	6.45	7.19	4.47
	40	5.21	6.95	7.19	6.95	6.45	6.95	8.19	6.45	8.68	5.71
	75	5.46	7.44	7.19	7.44	7.19	7.94	7.94	6.45	8.43	6.95
	90										

UNMASKED/DIM — instrument readings — 26 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	118	164	102	137	137	33	26	26	17	5
e	5	98	134	85	100	116	33	25	25	18	6
r	10	82	128	86	112	127	30	24	24	19	7
t	15	68	135	104	131	132	26	25	24	21	8
	20	55	142	104	05	100	28	26	24	19	10
TOP	30	39	110	70	64	53	27	31	24	22	12
	40	19	26	28	28	27	25	33	22	25	17
	75	19	28	28	28	30	33	32	21	29	23
	90										

candle power values — d=15.75'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	29.27	40.68	25.30	33.98	33.98	8.19	6.45	6.45	4.22	1.24
e	5	24.31	33.24	21.09	24.81	28.78	8.19	6.20	6.20	4.47	1.49
r	10	20.34	31.75	21.33	27.78	31.50	7.44	5.95	5.95	4.71	1.74
t	15	16.87	33.49	25.80	32.50	32.74	6.45	6.20	5.95	5.21	1.98
	20	13.64	35.22	25.80	26.05	24.81	6.95	6.45	5.95	4.71	2.48
TOP	30	9.67	27.29	17.36	15.88	13.15	6.70	7.69	5.95	5.46	2.98
	40	4.71	6.45	6.95	6.95	6.70	6.20	8.19	5.46	6.20	4.22
	75	4.71	6.95	6.95	6.95	7.44	8.19	7.94	5.21	7.19	5.71
	90										

Instrument readings — 25 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	173	128	104	124	145	37	35	35	22	12
e	5	139	154	125	132	134	41	35	36	21	12
r	10	124	133	98	116	114	43	36	38	20	14
t	15	137	137	96	121	106	44	35	40	20	15
	20	150	118	92	109	93	41	33	42	21	17
BTM	30	107	69	49	64	59	39	31	46	21	20
	40	25	34	25	35	34	36	33	49	22	28
	75	45	31	23	26	25	28	34	46	29	39
	90										

candle power values — d=15.75'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	42.91	31.75	25.80	30.76	35.97	9.18	8.68	8.68	5.46	2.98
e	5	34.48	38.20	31.01	32.74	33.24	10.17	8.68	8.93	5.21	2.98
r	10	30.76	32.99	24.31	28.78	28.28	10.67	8.93	9.43	4.96	3.47
t	15	33.98	33.98	23.81	30.02	26.29	10.91	8.68	9.92	4.96	3.72
	20	37.21	29.27	22.82	27.04	23.07	10.17	8.19	10.42	5.21	4.22
BTM	30	26.54	17.12	12.16	15.88	14.64	9.67	7.69	11.41	5.21	4.96
	40	6.20	8.43	6.20	8.68	8.43	8.93	8.19	12.16	5.46	6.95
	75	11.16	7.69	5.71	6.45	6.20	6.95	8.43	11.41	7.19	9.67
	90										

Instrument readings — 26 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	143	155	131	167	135	36	24	27	12	4
e	5	119	134	116	155	112	39	5	28	10	4
r	10	104	161	102	145	109	39	2'	31	10	6
t	15	104	152	87	112	85	35	23	33	10	7
	20	83	109	72	81	69	32	23	35	11	10
BTM	30	19	30	28	28	36	31	23	38	15	14
	40	17	24	24	22	29	33	24	39	18	19
	75	16	37	30	23	25	30	27	34	19	23
	90										

candle power values — d=15.75'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	35.47	38.45	32.50	41.43	33.49	8.93	5.95	6.70	2.98	0.99
e	5	29.52	33.24	28.78	38.45	27.78	9.67	6.20	6.95	2.48	0.99
r	10	25.80	39.94	25.30	35.97	27.04	9.67	6.20	7.69	2.48	1.49
t	15	25.80	37.71	21.58	27.78	21.09	8.68	5.71	8.19	2.48	1.74
	20	20.59	27.04	17.86	20.09	17.12	7.94	5.71	8.68	2.73	2.48
BTM	30	4.71	7.44	6.95	6.95	8.93	7.69	5.71	9.43	3.72	3.47
	40	4.22	5.95	5.95	5.46	7.19	8.19	5.95	9.67	4.47	4.71
	75	3.97	9.18	7.44	5.71	6.20	7.44	6.70	8.43	4.71	5.71
	90										

Table K-1d.

Measured data and calculated intensity values for type II lateral position light bulb, multiple samples; bulbs #7 and 8. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 27 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	124	139	111	120	141	31	24	26	22	4
e	5	95	116	80	95	120	30	24	25	23	5
r	10	102	109	83	100	119	26	23	24	24	5
t	15	107	113	100	113	123	25	23	24	23	6
	20	89	128	95	93	98	26	23	23	23	7
TOP	30	63	83	56	55	45	27	26	23	22	11
	40	20	26	28	26	24	23	28	24	24	15
	75	18	25	25	26	26	27	30	20	30	22
	90										

candle power values — d=15.75'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	30.76	34.48	27.53	29.77	34.98	7.69	5.95	6.45	5.46	0.99
e	5	23.57	28.78	19.85	23.57	29.77	7.44	5.95	6.20	5.71	1.24
r	10	25.30	27.04	20.59	24.81	29.52	6.45	5.71	5.95	5.95	1.24
t	15	26.54	28.03	24.81	28.03	30.51	6.20	5.71	5.95	5.71	1.49
	20	22.08	31.75	23.57	23.07	24.31	6.45	5.71	5.71	5.71	1.74
TOP	30	15.63	20.59	13.89	13.64	11.16	6.70	6.45	5.71	5.46	2.73
	40	4.96	6.45	6.95	6.45	5.95	5.71	6.95	5.95	5.95	3.72
	75	4.47	6.20	6.20	6.45	6.45	6.70	7.44	4.96	7.44	5.46
	90										

UNMASKED/DIM — Instrument readings — 28 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	158	151	151	214	188	49	48	38	26	9
e	5	113	211	130	183	171	45	46	36	30	10
r	10	98	228	149	189	159	38	45	36	32	12
t	15	94	260	155	132	121	36	45	35	35	14
	20	94	203	102	89	101	39	48	34	37	19
TOP	30	50	81	61	60	59	38	58	33	42	23
	40	30	35	36	38	37	38	51	30	43	31
	75	26	37	36	36	40	47	47	30	45	31
	90										

candle power values — d=15.75'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	39.19	37.46	37.46	53.09	46.64	12.16	11.91	9.43	6.45	2.23
e	5	28.03	52.34	32.25	45.40	42.42	11.16	11.41	8.93	7.44	2.48
r	10	24.31	56.56	36.96	46.88	39.44	9.43	11.16	8.93	7.94	2.98
t	15	23.32	64.50	38.45	32.74	30.02	8.93	11.16	8.68	8.68	3.47
	20	23.32	50.36	25.30	22.08	25.05	9.67	11.91	8.43	9.18	4.71
TOP	30	12.40	20.09	15.13	14.88	14.64	9.43	14.39	8.19	10.42	5.71
	40	7.44	8.68	8.93	9.43	9.18	9.43	12.65	7.44	10.67	7.69
	75	6.45	9.18	8.93	8.93	9.92	11.66	11.66	7.44	11.16	7.69
	90										

CCW — Instrument readings — 27 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	136	150	118	127	141	34	26	28	21	6
e	5	124	140	132	126	121	32	26	28	20	7
r	10	115	162	106	124	108	33	26	30	19	9
t	15	114	179	97	114	83	33	26	31	18	10
	20	93	142	77	89	67	30	24	33	17	11
BTM	30	22	37	31	34	35	26	23	38	16	15
	40	17	26	23	25	24	30	23	40	16	19
	75	19	39	29	26	23	21	26	36	20	29
	90										

candle power values — d=15.75'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	33.74	37.21	29.27	31.50	34.98	8.43	6.45	6.95	5.21	1.49
e	5	30.76	34.73	32.74	31.26	30.02	7.94	6.45	6.95	4.96	1.74
r	10	28.53	40.19	26.29	30.76	26.79	8.19	6.45	7.44	4.71	2.23
t	15	28.28	44.40	24.06	28.28	20.59	8.19	6.45	7.69	4.47	2.48
	20	23.07	35.22	19.10	22.08	16.62	7.44	5.95	8.19	4.22	2.73
BTM	30	5.46	9.18	7.69	8.43	8.68	6.45	5.71	9.43	3.97	3.72
	40	4.22	6.45	5.71	6.20	5.95	7.44	5.71	9.92	3.97	4.71
	75	4.71	9.67	7.19	6.45	5.71	5.21	6.45	8.93	4.96	7.19
	90										

CCW — Instrument readings — 28 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	113	255	186	230	190	50	49	36	27	11
e	5	100	215	214	278	159	55	49	37	26	11
r	10	84	221	188	235	142	57	47	39	25	11
t	15	77	261	165	226	130	51	43	42	26	13
	20	71	249	137	157	101	43	38	45	27	16
BTM	30	31	108	61	69	71	37	37	50	27	21
	40	25	41	36	36	39	39	36	54	27	29
	75	68	59	35	32	30	33	37	53	27	35
	90										

candle power values — d=15.75042'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	28.07	63.34	46.20	57.13	47.19	12.42	12.17	8.94	6.71	2.73
e	5	24.84	53.40	53.16	69.05	39.49	13.66	12.17	9.19	6.46	2.73
r	10	20.86	54.89	46.70	58.37	35.27	14.16	11.67	9.69	6.21	2.73
t	15	19.13	64.83	40.98	56.14	32.29	12.67	10.68	10.43	6.46	3.23
	20	17.64	61.85	34.03	39.00	25.09	10.68	9.44	11.18	6.71	3.97
BTM	30	7.70	26.83	15.15	17.14	17.64	9.19	9.19	12.42	6.71	5.22
	40	6.21	10.18	8.94	8.94	9.69	9.69	8.94	13.41	6.71	7.20
	75	16.89	14.66	8.69	7.95	7.45	8.20	9.19	13.16	6.71	8.69
	90										

Table K-1e.

Measured data and calculated intensity values for type II lateral position light bulb, multiple samples; bulbs #9 and 10. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 29 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	452	207	176	116	96	32	27	27	18	13
e	5	106	171	130	95	81	31	27	26	19	14
r	10	87	162	143	70	82	27	25	26	19	14
t	15	86	182	115	59	76	24	24	26	20	14
	20	96	165	74	63	67	24	25	26	22	15
TOP	30	54	59	43	43	39	27	27	25	26	15
	40	22	28	27	25	24	27	30	24	28	17
	75	17	27	27	26	24	28	28	22	32	25
	90										

d=15.75' — candle power values

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	37.71	51.35	43.66	28.78	23.81	7.94	6.70	6.70	4.47	3.22
e	5	26.29	42.42	32.25	23.57	20.09	7.69	6.70	6.45	4.71	3.47
r	10	21.58	40.19	35.47	17.36	20.34	6.70	6.20	6.45	4.71	3.47
t	15	21.33	45.15	28.53	14.64	18.85	5.95	5.95	6.45	4.96	3.47
	20	23.81	40.93	18.36	15.63	16.62	5.95	6.20	6.45	5.46	3.72
TOP	30	13.40	14.64	10.67	10.67	9.67	6.70	6.70	6.20	6.45	3.72
	40	5.46	6.95	6.70	6.20	5.95	6.70	7.44	5.95	6.95	4.22
	75	4.22	6.70	6.70	6.45	5.95	6.95	6.95	5.46	7.94	6.20
	90										

UNMASKED/DIM — Instrument readings — 1 Feb. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	118	122	119	127	170	28	26	22	17	4
e	5	100	101	95	107	146	28	26	21	18	4
r	10	120	94	101	109	159	28	25	22	18	4
t	15	145	107	96	95	130	28	25	21	18	4
	20	149	93	71	71	76	28	26	21	18	5
TOP	30	61	38	33	33	27	27	29	22	21	10
	40	24	28	27	28	25	25	28	22	27	15
	75	24	28	29	31	28	29	32	21	30	24
	90										

d=15.75' — candle power values

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	29.27	30.26	29.52	31.50	42.17	6.95	6.45	5.46	4.22	0.99
e	5	24.81	25.05	23.57	26.54	36.22	6.95	6.45	5.21	4.47	0.99
r	10	29.77	23.32	25.05	27.04	39.44	6.95	6.20	5.46	4.47	0.99
t	15	35.97	26.54	23.81	23.57	32.25	6.95	6.20	5.21	4.47	0.99
	20	36.96	23.07	17.61	17.61	18.85	6.95	6.45	5.21	4.47	1.24
TOP	30	15.13	9.43	8.19	8.19	6.70	6.70	7.19	5.46	5.21	2.48
	40	5.95	6.95	6.70	6.95	6.20	6.20	6.95	5.46	6.70	3.72
	75	5.95	6.95	7.19	7.69	6.95	7.19	7.94	5.21	7.44	5.95
	90										

Instrument readings — 29 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	121	221	244	135	93	36	27	24	22	12
e	5	97	164	219	107	80	42	27	24	20	11
r	10	87	188	179	94	79	45	27	26	19	10
t	15	84	190	114	67	71	41	25	27	18	10
	20	76	127	77	60	67	35	25	29	18	12
BTM	30	21	36	35	25	37	31	26	37	20	16
	40	19	27	30	19	24	30	26	41	19	18
	75	33	40	21	17	13	29	30	40	18	21
	90										

d=15.75' — candle power values

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	30.02	54.82	60.53	33.49	23.07	8.93	6.70	5.95	5.46	2.98
e	5	24.06	40.68	54.33	26.54	19.85	10.42	6.70	5.95	4.96	2.73
r	10	21.58	46.64	44.40	23.32	19.60	11.16	6.70	6.45	4.71	2.48
t	15	20.84	47.13	28.28	16.62	17.61	10.17	6.20	6.70	4.47	2.48
	20	18.85	31.50	19.10	14.88	16.62	8.68	6.20	7.19	4.47	2.98
BTM	30	5.21	8.93	8.68	6.20	9.18	7.69	6.45	9.18	4.96	3.97
	40	4.71	6.70	7.44	4.71	5.95	7.44	6.45	10.17	4.71	4.47
	75	8.19	9.92	5.21	4.22	3.22	7.19	7.44	9.92	4.47	5.21
	90										

Instrument readings — 1 Feb. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	133	120	130	134	134	28	24	22	16	5
e	5	114	118	165	126	113	32	25	23	16	5
r	10	111	112	109	115	103	36	24	24	15	6
t	15	131	115	94	104	89	36	23	25	14	7
	20	150	93	78	81	78	32	22	27	15	8
BTM	30	69	40	31	33	34	28	20	29	15	11
	40	19	24	18	23	24	26	20	32	19	18
	75	35	24	21	19	20	20	23	33	18	24
	90										

d=15.75' — candle power values

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	32.99	29.77	32.25	33.34	33.24	6.95	5.95	5.46	3.97	1.24
e	5	28.28	29.27	40.93	31.26	28.03	7.94	6.20	5.71	3.97	1.24
r	10	27.53	27.78	27.04	28.53	25.55	8.93	5.95	5.95	3.72	1.49
t	15	32.50	28.53	23.32	25.80	22.08	8.93	5.71	6.20	3.47	1.74
	20	37.21	23.07	19.35	20.09	19.35	7.94	5.46	6.70	3.72	1.98
BTM	30	17.12	9.92	7.69	8.19	8.43	6.95	4.96	7.19	3.72	2.73
	40	4.71	5.95	4.47	5.71	5.95	6.45	4.96	7.94	4.71	4.47
	75	8.68	5.95	5.21	4.71	4.96	4.96	5.71	8.19	4.47	5.95

Table K-1f.

Measured data and calculated intensity values for type II lateral position light bulb, multiple samples; bulbs #11 and 12. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 2 Feb. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	135	110	87	122	149	32	25	24	20	9
e	5	109	103	75	103	130	29	24	23	22	9
r	10	121	103	85	104	120	25	23	22	25	11
t	15	123	120	101	97	101	26	24	22	25	12
	20	114	126	80	71	71	26	25	22	26	13
TOP	30	49	46	35	35	32	33	30	23	28	17
	40	24	26	26	27	24	31	29	24	31	18
	75	23	27	26	28	27	30	32	23	29	22
	90										

candle power values — d=15.75'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	33.49	27.29	21.58	30.26	36.96	7.94	6.20	5.95	4.96	2.23
e	5	27.04	25.55	18.60	25.55	32.25	7.19	5.95	5.71	5.46	2.23
r	10	30.02	25.55	21.09	25.80	29.77	6.20	5.71	5.46	6.20	2.73
t	15	30.51	29.77	25.05	24.06	25.05	6.45	5.95	5.46	6.20	2.98
	20	28.28	31.26	19.85	17.61	17.61	6.45	6.20	5.46	6.45	3.22
TOP	30	12.16	11.41	8.68	8.68	7.94	8.19	7.44	5.71	6.95	4.22
	40	5.95	6.45	6.45	6.70	5.95	7.69	7.19	5.95	7.69	4.47
	75	5.71	6.70	6.45	6.95	6.70	7.44	7.94	5.71	7.19	5.46
	90										

UNMASKED/DIM — Instrument readings — 3 Feb. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	173	134	113	144	108	33	26	25	28	21
e	5	130	120	83	121	106	31	26	24	30	23
r	10	108	120	81	119	100	31	25	24	30	23
t	15	98	128	95	131	95	27	24	23	30	21
	20	85	157	112	106	77	25	24	23	31	21
TOP	30	42	93	48	36	33	25	31	23	30	21
	40	20	26	25	23	21	22	41	23	29	22
	75	11	19	17	19	19	28	38	21	29	25
	90										

candle power values — d=15.77083'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	43.03	33.33	28.11	35.82	26.86	8.21	6.47	6.22	6.96	5.22
e	5	32.33	29.85	20.64	30.10	26.36	7.71	6.47	5.97	7.46	5.72
r	10	26.86	29.85	20.15	29.60	24.87	7.71	6.22	5.97	7.46	5.72
t	15	24.37	31.84	23.63	32.58	23.63	6.72	5.97	5.72	7.46	5.22
	20	21.14	39.05	27.86	26.36	19.15	6.22	5.97	5.72	7.71	5.22
TOP	30	10.45	23.13	11.94	8.95	8.21	6.22	7.71	5.72	7.46	5.22
	40	4.97	6.47	6.22	5.72	5.22	5.47	10.20	5.72	7.21	5.47
	75	2.74	4.73	4.23	4.73	4.73	6.96	9.45	5.22	7.21	6.22
	90										

Instrument readings — 2 Feb. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	135	141	119	121	136	40	26	31	28	19
e	5	122	120	128	142	126	47	26	32	27	18
r	10	117	134	119	115	106	45	24	34	27	18
t	15	130	154	99	109	90	37	23	35	25	18
	20	132	157	91	91	72	31	22	35	24	19
BTM	30	60	103	46	46	52	30	24	36	22	20
	40	21	28	26	24	28	30	24	35	23	20
	75	28	21	21	19	20	24	29	30	21	28
	90										

candle power values — d=15.75'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	33.49	34.98	29.52	30.02	33.74	9.92	6.45	7.69	6.95	4.71
e	5	30.26	29.77	31.75	35.22	31.26	11.66	6.45	7.94	6.70	4.47
r	10	29.02	33.24	29.52	28.53	26.29	11.16	5.95	8.43	6.70	4.47
t	15	32.25	38.20	24.56	27.04	22.33	9.18	5.71	8.68	6.20	4.47
	20	32.74	38.95	22.57	22.57	17.86	7.69	5.46	8.68	5.95	4.71
BTM	30	14.88	25.55	11.41	11.41	12.90	7.44	5.95	8.93	5.46	4.96
	40	5.21	6.95	6.45	5.95	6.95	7.44	5.95	8.68	5.71	4.96
	75	6.95	5.21	5.21	4.71	4.96	5.95	7.19	7.44	5.21	6.95
	90										

Instrument readings — 3 Feb. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	92	142	124	147	93	34	23	21	22	18
e	5	62	118	116	123	73	40	22	22	20	17
r	10	39	157	122	148	71	39	21	23	19	18
t	15	25	198	112	103	59	33	21	24	18	17
	20	22	145	77	47	43	28	23	25	18	17
BTM	30	10	23	25	20	28	25	27	26	18	15
	40	10	19	23	17	22	25	26	28	17	7
	75	26	16	19	20	20	20	25	26	15	18
	90										

candle power values — d=15.77083'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	22.88	35.32	30.84	36.56	23.13	8.46	5.72	5.22	5.47	4.48
e	5	15.42	29.35	28.85	30.59	18.16	9.95	5.47	5.47	4.97	4.23
r	10	9.70	39.05	30.34	36.81	17.66	9.70	5.22	5.72	4.73	4.48
t	15	6.22	49.25	27.86	25.62	14.67	8.21	5.22	5.97	4.48	4.23
	20	5.47	36.06	19.15	11.69	10.69	6.96	5.72	6.22	4.48	4.23
BTM	30	2.49	5.72	6.22	4.97	6.96	6.22	6.72	6.47	4.48	3.73
	40	2.49	4.73	5.72	4.23	5.47	6.22	6.47	6.96	4.23	1.74
	75	6.47	3.98	4.73	4.97	4.97	4.97	6.22	6.47	3.73	4.48
	90										

Table K-1g.

Measured data and calculated intensity values for type II lateral position light bulb, multiple samples; bulbs #13 and 14. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 4 Feb. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	98	150	121	138	132	42	30	35	35	15
e	5	77	126	97	109	122	39	29	33	35	15
r	10	77	124	97	114	115	35	29	31	35	16
t	15	67	140	105	120	109	31	28	32	36	15
	20	50	166	99	83	85	29	28	31	37	15
TOP	30	32	64	45	44	48	31	30	30	36	18
	40	19	25	32	29	31	32	37	28	37	21
	75	16	22	25	28	30	27	36	25	35	33
	90										

candle power values — d=15.77083' — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	24.37	37.31	30.10	34.32	32.83	10.45	7.46	8.71	8.71	3.73
e	5	19.15	31.34	24.13	27.11	30.34	9.70	7.21	8.21	8.71	3.73
r	10	19.15	30.84	24.13	28.35	28.60	8.71	7.21	8.21	8.71	3.98
t	15	16.66	34.82	26.12	29.85	27.11	7.71	6.96	7.96	8.95	3.73
	20	12.44	41.29	24.62	20.64	21.14	7.21	6.96	7.71	9.20	3.73
TOP	30	7.96	15.92	11.19	10.94	11.94	7.71	7.46	7.46	8.95	4.48
	40	4.73	6.22	7.96	7.21	7.71	7.96	9.20	6.96	9.20	5.22
	75	3.98	5.47	6.22	6.96	7.46	6.72	8.95	6.22	8.71	8.21
	90										

UNMASKED/DIM — Instrument readings — 5 Feb. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	176	109	89	120	147	33	26	26	18	8
e	5	125	89	76	100	128	30	26	25	19	9
r	10	127	89	84	104	133	28	25	24	19	9
t	15	137	99	99	101	119	26	25	23	19	11
	20	136	94	76	75	72	25	25	23	20	12
TOP	30	58	40	37	36	32	26	28	23	21	14
	40	24	28	27	26	24	25	33	23	27	18
	75	20	26	24	25	23	27	36	20	24	22
	90										

candle power values — d=15.73958' — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	43.60	27.00	22.05	29.73	36.42	8.18	6.44	6.44	4.46	1.98
e	5	30.97	22.05	18.83	24.77	31.71	7.43	6.44	6.19	4.71	2.23
r	10	31.46	22.05	20.81	25.76	32.95	6.94	6.19	5.95	4.71	2.23
t	15	33.94	24.53	24.53	25.02	29.48	6.44	6.19	5.70	4.71	2.73
	20	33.69	23.29	18.83	18.58	17.84	6.19	6.19	5.70	4.95	2.97
TOP	30	14.37	9.91	9.17	8.92	7.93	6.44	6.94	5.70	5.20	3.47
	40	5.95	6.94	6.69	6.44	5.95	6.19	8.18	5.70	6.69	4.46
	75	4.95	6.44	5.95	6.19	5.70	6.69	8.92	4.95	5.95	5.45
	90										

Instrument readings — 4 Feb. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	140	160	140	148	126	43	26	34	29	15
e	5	111	137	125	127	113	44	25	35	28	15
r	10	110	178	128	120	110	41	24	37	27	15
t	15	93	192	100	79	83	35	24	38	27	16
	20	55	144	74	61	72	30	25	39	27	18
BTM	30	22	36	32	27	34	29	26	41	27	22
	40	18	27	26	22	27	31	26	40	28	23
	75	39	34	24	23	23	25	29	28	22	24
	90										

candle power values — d=15.77083' — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	34.82	39.80	34.82	36.81	31.34	10.69	6.47	8.46	7.21	3.73
e	5	27.61	34.07	31.09	31.59	28.11	10.94	6.22	8.71	6.96	3.73
r	10	27.36	44.27	31.84	29.85	27.36	10.20	5.97	9.20	6.72	3.73
t	15	23.13	47.75	24.87	19.65	20.64	8.71	5.97	9.45	6.72	3.98
	20	13.68	35.82	18.41	15.17	17.91	7.46	6.22	9.70	6.72	4.48
BTM	30	5.47	8.95	7.96	6.72	8.46	7.21	6.47	10.20	6.72	5.47
	40	4.48	6.72	6.47	5.47	6.72	7.71	6.47	9.95	6.96	5.72
	75	9.70	8.46	5.97	5.72	5.72	6.22	7.21	6.96	5.47	5.97
	90										

Instrument readings — DATE

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	137	135	92	104	120	32	21	22	23	16
e	5	123	138	120	114	113	31	22	23	23	16
r	10	114	143	100	112	102	32	21	24	21	16
t	15	121	155	88	92	74	32	22	25	21	15
	20	113	103	69	69	58	29	22	26	20	16
BTM	30	30	32	28	28	32	23	22	30	20	19
	40	13	22	20	22	24	26	22	34	21	18
	75	31	21	18	17	18	19	26	36	18	25
	90										

candle power values — d=15.73958' — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	33.94	33.44	22.79	25.76	29.73	7.93	5.20	5.45	5.70	3.96
e	5	30.47	34.19	29.73	28.24	27.99	7.68	5.45	5.70	5.70	3.96
r	10	28.24	35.43	24.77	27.75	25.27	7.93	5.20	5.95	5.20	3.96
t	15	29.98	38.40	21.80	22.79	18.33	7.93	5.45	6.19	5.20	3.72
	20	27.99	25.52	17.09	17.09	14.37	7.18	5.45	6.44	4.95	3.96
BTM	30	7.43	7.93	6.94	6.94	7.93	5.70	5.45	7.43	4.95	4.71
	40	3.22	5.45	4.95	5.45	5.95	6.44	5.45	8.42	5.20	4.46
	75	7.68	5.20	4.46	4.21	4.46	4.71	6.44	8.92	4.46	6.19
	90										

Appendix L.

Measured illuminance and calculated intensity data for 14 samples of Type III reflector lateral position light bulb used in the UH-1/OH-58A or C/AH-1 fixture in dim mode with an unmasked, red dome configuration.

Table L-1a.

Measured data and calculated intensity values for type III lateral position light bulb, multiple samples; bulbs #1 and 2. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 19 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	76	91	70	119	65	17	10	15	12	2
e	5	63	71	64	101	60	17	11	16	12	2
r	10	53	59	54	80	55	17	12	17	9	3
t	15	48	51	45	67	41	17	12	15	8	3
	20	43	44	44	44	25	17	12	16	8	4
TOP	30	21	22	19	17	16	19	12	14	8	5
	40	10	14	15	14	14	19	12	14	11	6
	75	11	12	15	18	18	24	23	13	10	6
	90										

candle power values — d=15.9270" — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	19.28	23.08	17.76	30.19	16.49	4.31	2.54	3.81	3.04	0.51
e	5	15.98	18.01	16.24	25.62	15.22	4.31	2.79	4.06	3.04	0.51
r	10	13.44	14.97	13.70	20.29	13.95	4.31	3.04	4.31	2.28	0.76
t	15	12.18	12.94	11.42	17.00	10.40	4.31	3.04	3.81	2.03	0.76
	20	10.91	11.16	11.16	11.16	6.34	4.31	3.04	4.06	2.03	1.01
TOP	30	5.33	5.58	4.82	4.31	4.06	4.82	3.04	3.55	2.03	1.27
	40	2.54	3.55	3.81	3.55	3.55	4.82	3.04	3.55	2.79	1.52
	75	2.79	3.04	3.81	4.57	4.57	6.09	5.83	3.30	2.54	1.52
	90										

UNMASKED/DIM — Instrument readings — 20 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	107	86	71	73	129	15	15	19	16	15
e	5	91	73	64	70	66	15	15	18	16	16
r	10	86	72	58	44	47	14	15	19	16	18
t	15	83	67	43	34	27	15	14	18	16	17
	20	68	52	34	21	18	15	14	19	16	15
TOP	30	14	19	17	17	16	17	16	19	16	14
	40	9	16	16	17	16	19	16	20	16	16
	75	8	14	14	15	16	24	27	21	18	16
	90										

candle power values — d=15.76042" — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	26.58	21.36	17.64	18.13	32.04	3.73	3.73	4.72	3.97	3.73
e	5	22.60	18.13	15.90	17.39	16.39	3.73	3.73	4.47	3.97	3.97
r	10	21.36	17.88	14.41	10.93	11.67	3.48	3.73	4.72	3.97	4.47
t	15	20.62	16.64	10.68	8.45	6.71	3.73	3.48	4.47	3.97	4.22
	20	16.89	12.92	8.45	5.22	4.47	3.73	3.48	4.72	3.97	3.73
TOP	30	3.48	4.72	4.22	4.22	3.97	4.22	3.97	4.72	3.97	3.48
	40	2.24	3.97	3.97	4.22	3.97	4.72	3.97	4.97	3.97	3.97
	75	1.99	3.48	3.48	3.73	3.97	5.96	6.71	5.22	4.47	3.97
	90										

Instrument readings — 19 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	72	72	61	101	53	12	6	9	8	1
e	5	84	95	68	120	59	12	5	10	8	0
r	10	67	77	67	112	58	12	5	9	8	0
t	15	61	54	65	99	53	11	5	11	8	1
	20	52	53	64	78	40	10	7	10	8	2
BTM	30	43	35	40	29	11	10	7	10	10	3
	40	11	8	9	9	7	11	8	9	9	7
	75	1	2	5	5	7	13	10	13	8	10
	90										

candle power values — d=15.9270" — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	18.26	18.26	15.47	25.62	13.44	3.04	1.52	2.28	2.03	0.25
e	5	21.31	24.10	17.25	30.44	14.97	3.04	1.27	2.54	2.03	0.00
r	10	17.00	19.53	17.00	28.41	14.71	3.04	1.27	2.28	2.03	0.00
t	15	15.47	13.70	16.49	25.11	13.44	2.79	1.27	2.79	2.03	0.25
	20	13.19	13.44	16.24	19.79	10.15	2.54	1.78	2.54	2.03	0.51
BTM	30	10.91	8.88	10.15	7.36	2.79	2.54	1.78	2.54	2.54	0.76
	40	2.79	2.03	2.28	2.28	1.78	2.79	2.03	2.28	2.28	1.78
	75	0.25	0.51	1.27	1.27	1.78	3.30	2.54	3.30	2.03	2.54
	90										

Instrument readings — 20 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	101	90	74	69	137	15	15	18	15	15
e	5	92	83	76	73	107	16	15	18	15	15
r	10	97	84	74	62	76	16	16	18	16	15
t	15	82	78	57	49	45	15	15	19	16	16
	20	65	63	45	29	20	15	16	20	16	16
BTM	30	25	21	16	16	15	15	17	21	18	16
	40	9	15	13	14	13	15	18	23	19	18
	75	6	11	13	13	13	20	21	22	15	19
	90										

candle power values — d=15.76042" — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	25.09	22.36	18.38	17.14	34.03	3.73	3.73	4.47	3.73	3.73
e	5	22.85	20.62	18.88	18.13	26.58	3.97	3.73	4.47	3.73	3.73
r	10	24.09	20.86	18.38	15.40	18.88	3.97	3.97	4.47	3.97	3.73
t	15	20.37	19.37	14.16	12.17	11.18	3.73	3.73	4.72	3.97	3.97
	20	16.15	15.65	11.18	7.20	4.97	3.73	3.97	4.97	3.97	3.97
BTM	30	6.21	5.22	3.97	3.97	3.73	3.73	4.22	5.22	4.47	3.97
	40	2.24	3.73	3.23	3.48	3.23	3.73	4.47	5.71	4.72	4.47
	75	1.49	2.73	3.23	3.23	3.23	4.97	5.22	5.46	3.73	4.72
	90										

Table L-1b.

Measured data and calculated intensity values for type III lateral position light bulb, multiple samples; bulbs #3 and 4. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 21 Jan. 1993

		CW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	113	113	106	90	68	17	15	16	15	12
e	5	84	96	98	108	70	16	16	17	15	13
r	10	68	91	84	97	69	16	15	17	15	14
t	15	69	85	65	70	56	15	15	17	15	14
	20	75	70	55	46	25	15	15	17	15	13
TOP	30	20	33	25	20	17	17	16	19	16	14
	40	5	16	17	18	17	19	17	19	16	15
	75	5	10	14	18	22	21	21	23	8	14
	90										

UNMASKED/DIM — Instrument readings — 22 Jan. 1993

		CW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	107	104	132	59	63	17	13	17	15	15
e	5	91	94	127	61	63	17	12	17	16	15
r	10	78	82	99	53	60	16	13	17	16	15
t	15	65	68	60	42	43	16	13	17	17	15
	20	57	56	47	34	21	17	13	18	18	16
TOP	30	26	32	23	19	16	18	13	19	19	14
	40	7	15	16	17	16	18	14	19	21	15
	75	3	7	11	15	17	22	17	22	13	11
	90										

candle power values — d=15.7708' — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	28.60	28.11	26.36	22.38	16.91	4.23	3.73	3.98	3.73	2.98
e	5	20.89	23.88	24.37	26.86	17.41	3.98	3.98	4.23	3.73	3.23
r	10	16.91	22.63	20.89	24.13	17.16	3.98	3.73	4.23	3.73	3.48
t	15	17.16	21.14	16.17	17.41	13.93	3.73	3.73	4.23	3.73	3.48
	20	18.65	17.41	13.68	11.44	6.22	3.73	3.73	4.23	3.73	3.23
TOP	30	4.97	8.21	6.22	4.97	4.23	4.23	3.98	4.73	3.98	3.48
	40	1.24	3.98	4.23	4.48	4.23	4.73	4.23	4.73	3.98	3.73
	75	1.24	2.49	3.48	4.48	5.47	5.22	5.22	5.72	1.99	3.48
	90										

candle power values — d=15.75' — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	26.54	25.80	32.74	14.64	15.63	4.22	3.22	4.22	3.72	3.72
e	5	22.57	23.32	31.50	15.13	15.63	4.22	2.98	4.22	3.97	3.72
r	10	19.35	20.34	24.56	13.15	14.88	3.97	3.22	4.22	3.97	3.72
t	15	16.12	16.87	14.88	10.42	10.67	3.97	3.22	4.22	4.22	3.72
	20	14.14	13.89	11.66	8.43	5.21	4.22	3.22	4.47	4.47	3.97
TOP	30	6.45	7.94	5.71	4.71	3.97	4.47	3.22	4.71	4.71	3.47
	40	1.74	3.72	3.97	4.22	3.97	4.47	3.47	4.71	5.21	3.72
	75	0.74	1.74	2.73	3.72	4.22	5.46	4.22	5.46	3.22	2.73
	90										

Instrument readings — 21 Jan. 1993

		CCW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	104	111	138	78	54	9	7	8	8	5
e	5	90	97	133	66	47	9	7	8	8	5
r	10	85	97	109	63	37	8	7	8	8	5
t	15	94	89	73	67	22	8	7	8	8	5
	20	95	73	61	33	18	8	7	8	8	6
BTM	30	34	33	21	18	15	8	7	8	8	6
	40	16	20	18	18	16	10	7	8	9	7
	75	17	20	20	22	23	11	8	9	7	10
	90										

Instrument readings — 22 Jan. 1993

		CCW horizontal angle 0	5	10	15	20	40	60	80	100	110
v	0	112	93	103	58	39	17	13	19	17	14
e	5	91	83	81	56	39	18	13	18	18	14
r	10	80	76	54	48	28	18	13	19	17	13
t	15	70	58	42	38	23	17	13	19	17	13
	20	59	44	37	33	24	17	13	19	17	13
BTM	30	40	35	22	17	16	18	13	19	16	15
	40	18	19	18	17	15	21	13	19	15	15
	75	14	16	16	20	20	23	16	19	13	18
	90										

candle power values — d=15.7604' — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	25.83	27.57	34.28	19.37	13.41	2.24	1.74	1.99	1.99	1.24
e	5	22.36	24.09	33.04	16.39	11.67	2.24	1.74	1.99	1.99	1.24
r	10	21.11	24.09	27.07	15.65	9.19	1.99	1.74	1.99	1.99	1.24
t	15	23.35	22.11	18.13	16.64	5.46	1.99	1.74	1.99	1.99	1.24
	20	23.60	18.13	15.15	8.20	4.47	1.99	1.74	1.99	1.99	1.49
BTM	30	8.45	8.20	5.22	4.47	3.73	1.99	1.74	1.99	1.99	1.49
	40	3.97	4.97	4.47	4.47	3.97	2.48	1.74	1.99	2.24	1.74
	75	4.22	4.97	4.97	5.46	5.71	2.73	1.99	2.24	1.74	2.48
	90										

candle power values — d=15.7604' — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	27.82	23.10	25.58	14.41	9.69	4.22	3.23	4.72	4.22	3.48
e	5	22.60	20.62	20.12	13.91	9.69	4.47	3.23	4.47	4.47	3.48
r	10	19.87	18.88	13.41	11.92	6.95	4.47	3.23	4.72	4.22	3.23
t	15	17.39	14.41	10.43	9.44	5.71	4.22	3.23	4.72	4.22	3.23
	20	14.66	10.93	9.19	8.20	5.96	4.22	3.23	4.72	4.22	3.23
BTM	30	9.94	8.69	5.46	4.22	3.97	4.47	3.23	4.72	3.97	3.73
	40	4.47	4.72	4.47	4.22	3.73	5.22	3.23	4.72	3.73	3.73
	75	3.48	3.97	3.97	4.97	4.97	5.71	3.97	4.72	3.23	4.47
	90										

Table L-1c.

Measured data and calculated intensity values for type III lateral position light bulb, multiple samples; bulbs #5 and 6. Intensity expressed in candelas.

UNMASKED/DIM — instrument readings — 25 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	57	102	85	103	61	24	13	18	12	10
e	5	47	90	76	96	60	22	12	19	12	10
r	10	42	90	75	77	51	20	12	20	12	10
t	15	35	81	63	53	30	17	12	21	13	10
	20	31	63	52	37	21	15	12	22	13	10
TOP	30	14	28	25	20	17	17	12	25	14	13
	40	8	17	17	19	18	19	13	32	14	14
	75	4	8	11	14	14	17	16	41	13	15
	90										

candle power values — d=15.75'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	14.14	25.30	21.09	25.55	15.13	5.95	3.22	4.47	2.98	2.48
e	5	11.66	22.33	18.85	23.81	14.88	5.46	2.98	4.71	2.98	2.48
r	10	10.42	22.33	18.60	19.10	12.65	4.96	2.98	4.96	2.98	2.48
t	15	8.68	20.09	15.63	13.15	7.44	4.22	2.98	5.21	3.22	2.48
	20	7.69	15.63	12.90	9.18	5.21	3.72	2.98	5.46	3.22	2.48
TOP	30	3.47	6.95	6.20	4.96	4.22	4.22	2.98	6.20	3.47	3.22
	40	1.98	4.22	4.22	4.71	4.47	4.71	3.22	7.94	3.47	3.47
	75	0.99	1.98	2.73	3.47	3.47	4.22	3.97	10.17	3.22	3.72
	90										

UNMASKED/DIM — instrument readings — 26 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	73	74	78	91	63	18	14	19	17	11
e	5	67	69	81	103	52	18	14	19	16	11
r	10	60	62	75	66	31	18	15	19	16	11
t	15	57	59	50	33	21	18	14	18	16	12
	20	48	39	28	23	17	18	15	19	16	13
TOP	30	15	19	16	15	15	21	14	19	16	14
	40	9	15	15	16	16	23	14	21	16	15
	75	6	12	15	17	17	28	20	15	19	16
	90										

candle power values — d=15.75'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	18.11	18.36	19.35	22.57	15.63	4.47	3.47	4.71	4.22	2.73
e	5	16.62	17.12	20.09	25.55	12.90	4.47	3.47	4.71	3.97	2.73
r	10	14.88	15.38	18.60	16.37	7.69	4.47	3.72	4.71	3.97	2.73
t	15	14.14	14.64	12.40	8.19	5.21	4.47	3.47	4.47	3.97	2.98
	20	11.91	9.67	6.95	5.71	4.22	4.47	3.72	4.71	3.97	3.22
TOP	30	3.72	4.71	3.97	3.72	3.72	5.21	3.47	4.71	3.97	3.47
	40	2.23	3.72	3.72	3.97	3.97	5.71	3.47	5.21	3.97	3.72
	75	1.49	2.98	3.72	4.22	4.22	6.95	4.96	3.72	4.71	3.97
	90										

UNMASKED/DIM — instrument readings — 25 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	85	105	86	45	54	21	13	19	12	10
e	5	101	105	92	40	53	21	12	18	12	10
r	10	89	85	79	31	47	18	12	17	11	11
t	15	74	84	78	26	49	17	12	18	11	12
	20	69	83	67	20	30	17	13	18	12	11
BTM	30	61	57	51	17	20	16	12	17	12	9
	40	22	24	23	16	17	17	14	17	13	11
	75	12	15	21	22	20	24	16	20	26	17
	90										

candle power values — d=15.76042'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	21.11	26.08	21.36	11.18	13.41	5.22	3.23	4.72	2.98	2.48
e	5	25.09	26.08	22.85	9.94	13.16	5.22	2.98	4.47	2.98	2.48
r	10	22.11	21.11	19.62	7.70	11.67	4.47	2.98	4.22	2.73	2.73
t	15	18.38	20.86	19.37	6.46	12.17	4.22	2.98	4.47	2.73	2.98
	20	17.14	20.62	16.64	4.97	7.45	4.22	3.23	4.47	2.98	2.73
BTM	30	15.15	14.16	12.67	4.22	4.97	3.97	2.98	4.22	2.98	2.24
	40	5.46	5.96	5.71	3.97	4.22	4.22	3.48	4.22	3.23	2.73
	75	2.98	3.73	5.22	5.46	4.97	5.96	3.97	4.97	6.46	4.22
	90										

UNMASKED/DIM — instrument readings — 26 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	84	68	85	77	57	17	13	20	16	9
e	5	67	61	80	66	50	17	13	20	16	9
r	10	56	60	73	56	36	17	14	20	16	9
t	15	57	58	60	45	26	17	13	20	16	9
	20	48	50	45	27	17	17	13	21	16	9
BTM	30	24	20	17	16	15	19	14	21	18	11
	40	13	14	13	14	15	20	14	21	18	15
	75	7	10	12	15	15	21	18	16	18	18
	90										

candle power values — d=15.75'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	20.84	16.87	21.09	19.10	14.14	4.22	3.22	4.96	3.97	3.23
e	5	16.62	15.13	19.85	16.37	12.40	4.22	3.22	4.96	3.97	2.23
r	10	13.89	14.88	18.11	13.89	8.93	4.22	3.47	4.96	3.97	2.23
t	15	14.14	14.39	14.88	11.16	6.45	4.22	3.22	4.96	3.97	2.23
	20	11.91	12.40	11.16	6.70	4.22	4.22	3.22	5.21	3.97	3.23
BTM	30	5.95	4.96	4.22	3.97	3.72	4.71	3.47	5.21	4.47	2.73
	40	3.22	3.47	3.22	3.47	3.72	4.96	3.47	5.21	4.47	3.72
	75	1.74	2.48	2.98	3.72	3.72	5.21	4.47	3.97	4.47	4.47
	90										

Table L-1d.

Measured data and calculated intensity values for type III lateral position light bulb, multiple samples; bulbs #7 and 8. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 27 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	93	88	96	117	110	25	23	30	21	11
e	5	81	73	88	106	83	24	22	30	20	11
r	10	78	76	82	83	46	24	22	31	20	13
t	15	76	73	72	54	30	24	21	31	21	15
	20	58	64	46	34	25	25	21	33	22	15
TOP	30	25	24	23	25	23	28	21	33	22	14
	40	18	20	21	22	24	31	22	28	22	17
	75	6	10	15	19	22	38	20	29	24	19
	90										

UNMASKED/DIM — Instrument readings — 28 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	122	151	173	74	90	27	21	24	25	18
e	5	98	126	155	74	94	27	20	24	24	17
r	10	79	111	119	70	84	27	20	24	24	17
t	15	74	92	83	62	61	27	21	25	24	16
	20	66	85	68	57	32	26	20	25	24	16
TOP	30	33	43	31	27	24	28	20	26	24	18
	40	23	23	24	24	23	31	22	27	26	20
	75	10	15	19	22	22	32	25	28	22	19
	90										

candle power values — d=15.72917' — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	23.50	21.77	23.75	28.95	27.21	6.19	5.69	7.42	5.20	2.72
e	5	20.04	18.06	21.77	26.23	20.53	5.94	5.44	7.42	4.95	2.72
r	10	19.30	18.80	20.29	20.53	11.38	5.94	5.44	7.67	4.95	3.22
t	15	18.80	18.06	17.81	13.36	7.42	5.94	5.20	7.67	5.20	3.71
	20	14.35	15.83	11.38	8.41	6.19	6.19	5.20	8.16	5.44	3.71
TOP	30	6.19	5.94	5.69	6.19	5.69	6.93	5.20	8.16	5.44	3.46
	40	4.45	4.95	5.20	5.44	5.94	7.67	5.44	6.93	5.44	4.21
	75	1.48	2.47	3.71	4.70	5.44	9.40	4.95	7.17	5.94	4.70
	90										

candle power values — d=15.72917' — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	30.18	37.36	42.80	18.31	22.27	6.68	5.20	5.94	6.19	4.45
e	5	24.25	31.17	38.35	18.31	23.26	6.68	4.95	5.94	5.94	4.21
r	10	19.55	27.46	29.44	17.32	20.78	6.68	4.95	5.94	5.94	4.21
t	15	18.31	22.76	20.53	15.34	15.09	6.68	5.20	6.19	5.94	3.96
	20	16.33	21.03	16.82	14.10	7.92	6.43	4.95	6.19	5.94	3.96
TOP	30	8.16	10.64	7.67	6.68	5.94	6.93	4.95	6.43	5.94	4.45
	40	5.69	5.69	5.94	5.94	5.69	7.67	5.44	6.68	6.43	4.95
	75	2.47	3.71	4.70	5.44	5.44	7.92	6.19	6.93	5.44	4.70
	90										

Instrument readings — 27 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	105	94	97	118	114	24	23	30	21	11
e	5	123	117	97	121	116	25	24	30	22	10
r	10	102	82	89	107	92	24	23	30	22	10
t	15	84	74	79	100	60	25	22	30	22	11
	20	77	73	78	89	37	24	22	30	22	12
BTM	30	61	66	53	31	23	24	23	30	22	15
	40	27	25	25	25	23	26	20	29	23	18
	75	13	19	19	25	27	30	23	23	24	24
	90										

Instrument readings — 28 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	117	152	165	77	85	27	20	24	24	15
e	5	104	136	165	71	76	27	20	24	25	16
r	10	87	113	148	60	62	27	21	24	24	16
t	15	72	102	121	57	65	27	20	24	25	16
	20	68	98	89	63	53	26	19	24	25	17
BTM	30	50	59	46	27	24	25	19	24	25	18
	40	27	25	25	23	21	27	21	24	25	21
	75	15	18	25	32	28	35	22	24	20	27
	90										

candle power values — d=15.72917' — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	25.98	23.26	24.00	29.19	28.20	5.94	5.69	7.42	5.20	2.72
e	5	30.43	28.95	24.00	29.94	28.70	6.19	5.94	7.42	5.44	2.47
r	10	25.24	20.29	22.02	26.47	22.76	5.94	5.69	7.42	5.44	2.47
t	15	20.78	18.31	19.55	24.74	14.84	6.19	5.44	7.42	5.44	2.72
	20	19.05	18.06	19.30	22.02	9.15	5.94	5.44	7.42	5.44	2.97
BTM	30	15.09	16.33	13.11	7.67	5.69	5.94	5.69	7.42	5.44	3.71
	40	6.68	6.19	6.19	6.19	5.69	6.43	4.95	7.17	5.69	4.45
	75	3.22	4.70	4.70	6.19	6.68	7.42	5.69	5.69	5.94	5.94
	90										

candle power values — d=15.72917' — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	28.95	37.61	40.82	19.05	21.03	6.68	4.95	5.94	5.94	3.71
e	5	25.73	33.65	40.82	17.57	18.80	6.68	4.95	5.94	6.19	3.96
r	10	21.52	27.96	36.62	14.84	15.34	6.68	5.20	5.94	5.94	3.96
t	15	17.81	25.24	29.94	14.10	16.08	6.68	4.95	5.94	6.19	3.96
	20	16.82	24.25	22.02	15.59	13.11	6.43	4.70	5.94	6.19	4.21
BTM	30	12.37	14.60	11.38	6.68	5.94	6.19	4.70	5.94	6.19	4.45
	40	6.68	6.19	6.19	5.69	5.20	6.68	5.20	5.94	6.19	5.20
	75	3.71	4.45	6.19	7.92	6.93	8.66	5.44	5.94	4.95	6.68
	90										

Table L-1e.

Measured data and calculated intensity values for type III lateral position light bulb, multiple samples; bulbs #9 and 10. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 29 Jan. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	102	91	67	103	87	16	15	25	16	10
e	5	84	74	64	88	69	16	16	24	17	11
r	10	76	68	55	58	51	14	15	25	17	12
t	15	82	64	46	37	26	14	15	25	17	12
	20	69	48	32	23	20	15	15	24	17	12
TOP	30	18	19	18	18	17	16	15	23	17	11
	40	10	15	16	17	16	20	16	24	18	13
	75	5	10	13	15	18	27	26	17	15	15
	90										

d=15.7395" — candle power values — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	2	22.54	16.60	25.52	21.55	3.96	3.72	6.19	3.96	2.48
e	5	20	18.33	15.86	21.80	17.09	3.96	3.96	5.95	4.21	2.73
r	10	18.83	16.85	13.63	14.37	12.63	3.47	3.72	6.19	4.21	2.97
t	15	20.31	15.86	11.40	9.17	6.44	3.47	3.72	6.19	4.21	2.97
	20	17.09	11.89	7.93	5.45	4.95	3.72	3.72	5.95	4.21	2.97
TOP	30	4.46	4.71	4.46	4.46	4.21	3.96	3.72	5.70	4.21	2.73
	40	2.48	3.72	3.96	4.21	3.96	4.95	3.96	5.95	4.46	3.22
	75	1.24	2.48	3.22	3.72	4.46	6.69	6.44	4.21	3.72	3.72
	90										

UNMASKED/DIM — Instrument readings — 1 Feb. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	72	79	77	101	84	20	15	19	17	11
e	5	66	70	75	100	72	20	15	19	17	12
r	10	65	69	70	72	54	20	14	19	18	13
t	15	63	60	54	50	28	20	15	19	18	13
	20	42	42	31	25	20	21	15	20	18	14
TOP	30	16	18	18	18	17	20	16	21	18	13
	40	15	16	16	17	17	21	16	22	18	14
	75	7	10	11	14	14	24	19	21	17	16
	90										

d=15.75" — candle power values — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	17.86	19.60	19.10	25.05	20.84	4.96	3.72	4.71	4.22	2.73
e	5	16.37	17.36	16.60	24.81	17.86	4.96	3.72	4.71	4.22	2.98
r	10	16.12	17.12	17.36	17.86	13.40	4.96	3.47	4.71	4.47	3.22
t	15	15.63	14.88	13.40	12.40	6.95	4.96	3.72	4.71	4.47	3.22
	20	10.42	10.42	7.69	6.20	4.96	5.21	3.72	4.96	4.47	3.47
TOP	30	3.97	4.47	4.47	4.47	4.22	4.96	3.97	5.21	4.47	3.22
	40	3.72	3.97	3.97	4.22	4.22	5.21	3.97	5.46	4.47	3.47
	75	1.74	2.48	2.73	3.47	3.47	3.95	4.71	5.21	4.22	3.97
	90										

Instrument readings — 29 Jan. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	109	91	68	106	88	16	15	25	15	9
e	5	119	92	69	117	86	16	16	26	15	8
r	10	97	74	70	114	78	17	16	26	15	8
t	15	79	73	70	92	49	16	15	26	15	8
	20	74	72	60	43	23	16	14	27	16	9
BTM	30	29	24	20	19	17	15	14	28	18	12
	40	16	17	17	18	16	16	14	30	18	18
	75	9	14	15	17	16	21	19	22	19	18
	90										

d=15.7395" — candle power values — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	27.00	22.54	16.85	26.26	21.80	3.96	3.72	6.19	3.72	2.23
e	5	29.48	22.79	17.09	28.98	21.31	3.96	3.96	6.44	3.72	1.98
r	10	24.03	18.33	17.34	28.24	19.32	4.21	3.96	6.44	3.72	1.98
t	15	19.57	18.08	17.34	22.79	12.14	3.96	3.72	6.44	3.72	1.98
	20	18.33	17.84	14.86	10.65	5.70	3.96	3.47	6.69	3.96	2.23
BTM	30	7.18	5.95	4.95	4.71	4.21	3.72	3.47	6.94	4.46	2.97
	40	3.96	4.21	4.21	4.46	3.96	3.96	3.47	7.43	4.46	4.46
	75	2.23	3.47	3.72	4.21	3.96	5.20	4.71	5.45	4.71	4.46
	90										

Instrument readings — 1 Feb. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	79	83	78	97	90	20	14	19	17	11
e	5	80	82	77	101	86	19	14	19	17	10
r	10	73	72	73	98	76	19	14	19	18	10
t	15	70	68	71	85	57	19	14	19	18	11
	20	68	70	67	68	37	19	14	18	18	12
BTM	30	40	37	25	22	18	19	16	18	19	15
	40	17	16	17	17	16	21	15	19	20	18
	75	8	11	12	16	18	25	18	19	23	18
	90										

d=15.7395" — candle power values — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	19.57	20.56	19.32	24.03	22.30	4.95	3.47	4.71	4.21	2.73
e	5	19.82	20.31	19.08	25.02	21.31	4.71	3.47	4.71	4.21	2.48
r	10	18.08	17.84	18.08	24.28	18.83	4.71	3.47	4.71	4.46	2.48
t	15	17.34	16.85	17.59	21.06	14.12	4.71	3.47	4.71	4.46	2.73
	20	16.85	17.34	16.60	16.85	9.17	4.71	3.47	4.46	4.46	2.97
BTM	30	9.91	9.17	6.19	5.45	4.46	4.71	3.96	4.46	4.71	3.72
	40	4.21	3.96	4.21	4.21	3.96	5.20	3.72	4.71	4.95	4.46
	75	1.98	2.73	2.97	3.96	4.46	6.19	4.46	4.71	5.70	4.46
	90										

Table L-1f.

Measured data and calculated intensity values for type III lateral position light bulb, multiple samples; bulbs #11 and 12. Intensity expressed in candelas.

UNMASKED/DIM — Instrument readings — 2 Feb. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	81	89	73	119	85	19	14	19	13	11
e	5	69	79	74	116	86	20	14	18	12	11
r	10	57	73	73	114	73	21	14	19	13	11
t	15	58	70	64	87	46	21	14	18	13	11
	20	52	58	48	38	25	21	14	18	15	11
TOP	30	15	22	20	18	17	21	15	19	15	12
	40	12	18	18	19	19	23	15	19	17	11
	75	8	12	14	14	16	26	21	16	11	12
	90										

candle power values — d=15.75'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	20.09	22.08	18.11	29.52	21.09	4.71	3.47	4.71	3.22	2.73
e	5	17.12	19.60	18.36	28.78	21.33	4.96	3.47	4.47	2.98	2.73
r	10	14.14	18.11	18.11	28.28	18.11	5.21	3.47	4.71	3.22	2.73
t	15	14.39	17.36	15.88	21.58	11.41	5.21	3.47	4.47	3.22	2.73
	20	12.90	14.39	11.91	9.43	6.20	5.21	3.47	4.47	3.72	2.73
TOP	30	3.72	5.46	4.96	4.47	4.22	5.21	3.72	4.71	3.72	2.98
	40	2.98	4.47	4.47	4.71	4.71	5.71	3.72	4.71	4.22	2.73
	75	1.98	2.98	3.47	3.47	3.97	6.45	5.21	3.97	2.73	2.98
	90										

UNMASKED/DIM — Instrument readings — 3 Feb. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	97	86	73	85	93	16	18	17	14	7
e	5	93	77	68	71	90	16	18	19	14	8
r	10	91	75	64	61	66	16	17	18	14	8
t	15	91	70	56	48	34	16	17	20	13	9
	20	72	55	40	28	22	17	17	21	14	9
TOP	30	20	21	18	17	16	19	17	23	16	10
	40	13	14	14	16	16	19	19	24	18	12
	75	6	11	12	15	16	20	23	17	13	12
	90										

candle power values — d=15.72917'

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	24.00	21.28	18.06	21.03	23.01	3.96	4.45	4.21	3.46	1.73
e	5	23.01	19.05	16.82	17.57	22.27	3.96	4.45	4.70	3.46	1.98
r	10	22.51	18.56	15.83	15.09	16.33	3.96	4.21	4.45	3.46	1.98
t	15	22.51	17.32	13.85	11.88	8.41	3.96	4.21	4.95	3.22	2.23
	20	17.81	13.61	9.90	6.93	5.44	4.21	4.21	5.20	3.46	2.23
TOP	30	4.95	5.20	4.45	4.21	3.96	4.70	4.21	5.69	3.96	2.47
	40	3.22	3.46	3.46	3.96	3.96	4.70	4.70	5.94	4.45	2.97
	75	1.48	2.72	2.97	3.71	3.96	4.95	5.69	4.21	3.22	2.97
	90										

Instrument readings — 2 F[illegible]. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	82	91	73	118	85	19	14	19	14	9
e	5	87	97	70	129	77	19	14	19	14	9
r	10	80	76	73	129	69	18	15	19	14	9
t	15	65	73	73	99	62	18	16	18	14	9
	20	54	67	64	67	51	18	16	18	14	10
BTM	30	37	40	29	22	20	18	15	17	13	13
	40	8	17	17	18	17	18	15	18	15	14
	75	4	12	14	18	21	24	18	20	14	17
	90										

candle power values — d=15.71875'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	20.26	22.48	18.04	29.16	21.00	4.69	3.46	4.69	3.46	2.22
e	5	21.50	23.97	17.30	31.87	19.03	4.69	3.46	4.69	3.46	2.22
r	10	19.77	18.78	18.04	31.87	17.05	4.45	3.71	4.69	3.46	2.22
t	15	16.06	18.04	18.04	24.46	15.32	4.45	3.95	4.45	3.46	2.22
	20	13.34	16.55	15.81	16.55	12.60	4.45	3.95	4.45	3.46	2.47
BTM	30	9.14	9.88	7.17	5.44	4.94	4.45	3.71	4.20	3.21	3.21
	40	1.98	4.20	4.20	4.45	4.20	4.45	3.71	4.45	3.71	3.46
	75	0.99	2.96	3.46	4.45	5.19	5.93	4.45	4.94	3.46	4.20
	90										

Instrument readings — 3 Feb. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	95	93	77	79	108	17	19	18	15	8
e	5	102	105	93	86	96	17	19	18	15	8
r	10	92	89	71	79	87	18	20	18	15	9
t	15	78	78	62	66	66	18	20	18	15	10
	20	67	72	59	57	48	17	20	18	16	12
BTM	30	52	45	34	29	21	16	19	18	18	15
	40	17	19	18	18	17	16	17	17	20	16
	75	12	20	17	20	21	25	19	18	19	21
	90										

candle power values — d=15.72917'

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	23.50	23.01	19.05	19.55	26.72	4.21	4.70	4.45	3.71	1.98
e	5	25.24	25.98	23.01	21.28	23.75	4.21	4.70	4.45	3.71	1.98
r	10	22.76	22.02	17.57	19.55	21.52	4.45	4.95	4.45	3.71	2.23
t	15	19.30	19.30	15.34	16.33	16.33	4.45	4.95	4.45	3.71	2.47
	20	16.58	17.81	14.60	14.10	11.88	4.21	4.95	4.45	3.96	2.97
BTM	30	12.87	11.13	8.41	7.17	5.20	3.96	4.70	4.45	4.45	3.71
	40	4.21	4.70	4.45	4.45	4.21	3.96	4.21	4.21	4.95	3.96
	75	2.97	4.95	4.21	4.95	5.20	6.19	4.70	4.45	4.70	5.20
	90										

Table L-1g.

Measured data and calculated intensity values for type III lateral position light bulb, multiple samples; bulbs #13 and 14. Intensity expressed in candelas.

UNMASKED/DIM — instrument readings — 4 Feb. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	95	88	79	73	70	17	15	21	22	16
e	5	89	84	78	70	61	17	15	22	21	16
r	10	74	76	69	52	44	17	14	21	22	16
t	15	64	70	56	44	39	17	14	21	22	16
	20	58	53	44	37	28	16	14	21	24	16
TOP	30	29	33	29	21	17	16	14	21	26	20
	40	16	20	19	18	16	18	14	21	28	16
	75	13	18	20	20	20	26	20	22	21	19
	90										

candle power values — d=15.7395ft — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	23.53	21.80	19.57	18.08	17.34	4.21	3.72	5.20	5.45	3.96
e	5	22.05	20.81	19.32	17.34	15.11	4.21	3.72	5.45	5.20	3.96
r	10	18.33	18.83	17.09	12.88	10.90	4.21	3.47	5.20	5.45	3.96
t	15	15.86	17.34	13.87	10.90	9.66	4.21	3.47	5.20	5.45	3.96
	20	14.37	13.13	10.90	9.17	6.94	3.96	3.47	5.20	5.95	3.96
TOP	30	7.18	8.18	7.18	5.20	4.21	3.96	3.47	5.20	6.44	4.95
	40	3.96	4.95	4.71	4.46	3.96	4.46	3.47	5.20	6.94	3.96
	75	3.22	4.46	4.95	4.95	4.95	6.44	4.95	5.45	5.20	4.71
	90										

UNMASKED/DIM — instrument readings — 5 Feb. 1993

		CW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	102	94	118	79	39	16	14	20	16	12
e	5	84	81	89	72	43	16	14	20	17	12
r	10	71	69	61	57	37	16	14	20	18	12
t	15	64	56	48	43	26	16	13	21	18	13
	20	50	50	42	28	21	15	14	20	18	16
TOP	30	21	28	21	19	17	18	15	21	16	16
	40	8	15	17	18	16	21	16	22	16	16
	75	6	11	15	19	22	25	18	17	18	17
	90										

candle power values — d=15.7291ft — CW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	25.24	23.26	29.19	19.55	9.65	3.96	3.46	4.95	3.96	2.97
e	5	20.78	20.04	22.02	17.81	10.64	3.96	3.46	4.95	4.21	2.97
r	10	17.57	17.07	15.09	14.10	9.15	3.96	3.46	4.95	4.45	2.97
t	15	15.83	13.85	11.88	10.64	6.43	3.96	3.22	5.20	4.45	3.22
	20	12.37	12.37	10.39	6.93	5.20	3.71	3.46	4.95	4.45	3.96
TOP	30	5.20	6.93	5.20	4.70	4.21	4.45	3.71	5.20	3.96	3.96
	40	1.98	3.71	4.21	4.45	3.96	5.20	3.96	5.44	3.96	3.96
	75	1.48	2.72	3.71	4.70	5.44	6.19	4.45	4.21	4.45	4.21
	90										

DATE — instrument readings — 4 Feb. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	96	86	81	75	69	17	15	21	22	15
e	5	78	75	78	69	58	16	16	20	23	15
r	10	68	76	70	58	48	16	15	21	24	16
t	15	67	65	60	46	37	16	15	21	24	18
	20	55	57	51	40	24	15	15	21	25	19
BTM	30	18	30	30	19	17	16	15	21	23	19
	40	7	15	17	16	15	18	15	21	24	23
	75	4	9	15	20	20	24	18	25	21	18
	90										

candle power values — d=15.7291ft — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	23.75	21.28	20.04	18.56	17.07	4.21	3.71	5.20	5.44	3.71
e	5	19.30	18.56	19.30	17.07	14.35	3.96	3.96	4.95	5.69	3.71
r	10	16.82	18.80	17.32	14.35	11.88	3.96	3.71	5.20	5.94	3.96
t	15	16.58	16.08	14.84	11.38	9.15	3.96	3.71	5.20	5.94	4.45
	20	13.61	14.10	12.62	9.90	5.94	3.71	3.71	5.20	6.19	4.70
BTM	30	4.45	7.42	7.42	4.70	4.21	3.96	3.71	5.20	5.69	4.70
	40	1.73	3.71	4.21	3.96	3.71	4.45	3.71	5.20	5.94	5.69
	75	0.99	2.23	3.71	4.95	4.95	5.94	4.45	6.19	5.20	4.45
	90										

instrument readings — 5 Feb. 1993

		CCW horizontal angle									
		0	5	10	15	20	40	60	80	100	110
v	0	116	107	114	95	42	16	13	20	18	12
e	5	105	99	126	77	34	17	14	20	17	12
r	10	108	94	111	61	30	16	14	20	17	12
t	15	76	80	64	53	23	16	14	20	18	12
	20	71	63	56	26	19	16	14	20	16	14
BTM	30	31	35	24	18	16	16	14	20	16	19
	40	13	18	17	17	15	16	13	20	17	21
	75	14	20	19	21	21	23	16	19	18	19
	90										

candle power values — d=15.7291ft — CCW horizontal angle

		0	5	10	15	20	40	60	80	100	110
v	0	28.70	26.47	28.20	23.50	10.39	3.96	3.22	4.95	4.45	2.97
e	5	25.98	24.49	31.17	19.05	8.41	4.21	3.46	4.95	4.21	2.97
r	10	26.72	23.26	27.46	15.09	7.42	3.96	3.46	4.95	4.21	2.97
t	15	18.80	19.79	15.83	13.11	5.69	3.96	3.46	4.95	4.45	2.97
	20	17.57	15.59	13.85	6.43	4.70	3.96	3.46	4.95	3.96	3.46
BTM	30	7.67	8.66	5.94	4.45	3.96	3.96	3.46	4.95	3.96	4.70
	40	3.22	4.45	4.21	4.21	3.71	3.96	3.22	4.95	4.21	5.20
	75	3.46	4.95	4.70	5.20	5.20	5.69	3.96	4.70	4.45	4.70
	90										

Appendix M.

Measured illuminance and calculated intensity data for 12 samples of the tail position light bulb used in the OH-58A, C, or D/AH-1 fixture in dim mode with an unmasked dome configuration.

Table M-1a.

Measured data and calculated intensity values for tail position light bulb, multiple samples; bulbs #1 and 2. Intensity expressed in candelas.

UNMASKED/DIM Instrument readings 8 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	70	57	63	55	62
e	5	62	62	62	56	62
r	10	59	58	60	56	63
t	15	60	60	58	57	62
	20	58	58	55	57	62
TOP	30	60	58	54	57	61
	40	56	54	53	56	61
	75	53	43	46	50	51
	90					

UNMASKED/DIM Instrument readings 8 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	62	62	53	53	
e	5	63	60	53	53	
r	10	68	60	53	53	
t	15	66	56	53	53	
	20	62	61	53	53	
BOT	30	58	60	51	53	
	40	57	54	52	53	
	75	44	46	51	50	
	90					

UNMASKED/DIM Instrument readings 9 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	72	59	56	51	54
e	5	65	59	56	51	54
r	10	63	59	62	50	54
t	15	59	59	59	51	55
	20	58	53	61	52	55
TOP	30	56	55	57	55	57
	40	57	54	54	56	58
	75	43	43	53	55	51
	90					

UNMASKED/DIM Instrument readings 9 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	67	62	59	52	53
e	5	61	62	57	53	54
r	10	66	62	62	53	54
t	15	63	60	62	51	54
	20	60	60	60	52	54
BOT	30	57	57	58	54	54
	40	55	54	55	54	50
	75	43	42	50	53	51
	90					

candle power values

d=15.75' CW horizontal angle

		0	20	40	60	70
v	0	17.36	14.14	15.63	13.64	15.38
e	5	15.38	15.38	15.38	13.89	15.38
r	10	14.64	14.39	14.88	13.89	15.63
t	15	14.88	14.88	14.39	14.14	15.38
	20	14.39	14.39	13.64	14.14	15.38
TOP	30	14.88	14.39	13.40	14.14	15.13
	40	13.89	13.40	13.15	13.89	15.13
	75	13.15	10.67	11.41	12.40	12.65
	90					

candle power values

d=15.75' CW horizontal angle

		0	20	40	60	70
v	0	0.00	15.38	15.38	13.15	13.15
e	5	0.00	15.63	14.88	13.15	13.15
r	10	0.00	16.87	14.88	13.15	13.15
t	15	0.00	16.37	13.89	13.15	13.15
	20	0.00	15.38	15.13	13.15	13.15
BOT	30	0.00	14.39	14.88	12.65	13.15
	40	0.00	14.14	13.40	12.90	13.15
	75	0.00	10.91	11.41	12.65	12.40
	90					

candle power values

d=15.72917' CW horizontal angle

		0	20	40	60	70
v	0	17.81	14.60	13.85	12.62	13.36
e	5	16.08	14.60	13.85	12.62	13.36
r	10	15.59	14.60	15.34	12.37	13.36
t	15	14.60	14.60	14.60	12.62	13.61
	20	14.35	13.11	15.09	12.87	13.61
TOP	30	13.85	13.61	14.10	13.61	14.10
	40	14.10	13.36	13.36	13.85	14.35
	75	10.64	10.64	13.11	13.61	12.62
	90					

candle power values

d=15.72917' CW horizontal angle

		0	20	40	60	70
v	0	16.58	15.34	14.60	12.87	13.11
e	5	15.09	15.34	14.10	13.11	13.36
r	10	16.33	15.34	15.34	13.11	13.36
t	15	15.59	14.84	15.34	12.62	13.36
	20	14.84	14.84	14.84	12.87	13.36
BOT	30	14.10	14.10	14.35	13.36	13.36
	40	13.61	13.36	13.61	13.36	12.37
	75	10.64	10.39	12.37	13.11	12.62
	90					

Instrument readings 8 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		61	60	52	52
e	5		63	60	53	52
r	10		64	61	55	53
t	15		60	59	54	53
	20		61	63	55	53
TOP	30		65	55	54	51
	40		61	56	54	49
	75		59	62	47	37
	90					

Instrument readings 8 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0	65	63	62	56	64
e	5	62	67	62	57	63
r	10	68	56	59	57	63
t	15	65	58	63	58	63
	20	62	65	61	57	63
BOT	30	58	53	60	58	64
	40	54	58	57	60	63
	75	48	57	57	47	41
	90					

Instrument readings 9 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		61	54	54	53
e	5		57	66	54	53
r	10		64	62	55	54
t	15		61	61	56	55
	20		63	62	57	55
TOP	30		59	58	58	57
	40		58	54	56	53
	75		53	58	49	42
	90					

Instrument readings 9 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		61	57	52	57
e	5		62	57	52	58
r	10		58	57	53	58
t	15		60	59	55	59
	20		61	59	55	58
BOT	30		58	59	58	57
	40		61	55	61	59
	75		55	56	48	46
	90					

candle power values

d=15.75' CCW horizontal angle

		0	20	40	60	70
v	0	0.00	15.13	14.88	12.90	12.90
e	5	0.00	15.63	14.88	13.15	12.90
r	10	0.00	15.88	15.13	13.64	13.15
t	15	0.00	14.88	14.64	13.40	13.15
	20	0.00	15.13	15.63	13.64	13.15
TOP	30	0.00	16.12	13.64	13.40	12.65
	40	0.00	15.13	13.89	13.40	12.16
	75	0.00	14.64	15.38	11.66	9.18
	90					

candle power values

d=15.75' CCW horizontal angle

		0	20	40	60	70
v	0	16.12	15.63	15.38	13.89	15.88
e	5	15.38	16.62	15.38	14.14	15.63
r	10	16.87	13.89	14.64	14.14	15.63
t	15	16.12	14.39	15.63	14.39	15.63
	20	15.38	16.12	15.13	14.14	15.63
BOT	30	14.39	13.15	14.88	14.39	15.88
	40	13.40	14.39	14.14	14.88	15.63
	75	11.91	14.14	14.14	11.66	10.17
	90					

candle power values

d=15.72917' CCW horizontal angle

		0	20	40	60	70
v	0	0.00	15.09	13.36	13.36	13.11
e	5	0.00	14.10	16.33	13.36	13.11
r	10	0.00	15.83	15.34	13.61	13.36
t	15	0.00	15.09	15.09	13.85	13.61
	20	0.00	15.59	15.34	14.10	13.61
TOP	30	0.00	14.60	14.35	14.35	14.10
	40	0.00	14.35	13.36	13.85	13.11
	75	0.00	13.11	14.35	12.12	10.39
	90					

candle power values

d=15.72917' CCW horizontal angle

		0	20	40	60	70
v	0	0.00	15.09	14.10	12.87	14.10
e	5	0.00	15.34	14.10	12.87	14.35
r	10	0.00	14.35	14.10	13.11	14.35
t	15	0.00	14.84	14.60	13.61	14.60
	20	0.00	15.09	14.60	13.61	14.35
BOT	30	0.00	14.35	14.60	14.35	14.10
	40	0.00	15.09	13.61	15.09	14.60
	75	0.00	13.61	13.85	11.88	11.38
	90					

Table M-1b.

Measured data and calculated intensity values for tail position light bulb, multiple samples; bulbs #3 and 4. Intensity expressed in candelas.

UNMASKED/DIM Instrument readings 9 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	64	61	60	55	55
e	5	65	63	61	54	54
r	10	63	56	58	54	54
t	15	59	58	60	53	55
	20	62	55	57	53	56
TOP	30	59	55	53	55	57
	40	54	51	51	57	58
	75	43	45	52	52	49
	90					

candle power values

d=15.77083'		CW horizontal angle 0	20	40	60	70
v	0	15.92	15.17	14.92	13.68	13.68
e	5	16.17	15.67	15.17	13.43	13.43
r	10	15.67	13.93	14.43	13.43	13.43
t	15	14.67	14.43	14.92	13.18	13.68
	20	15.42	13.68	14.18	13.18	13.93
TOP	30	14.67	13.68	13.18	13.68	14.18
	40	13.43	12.68	12.68	14.18	14.43
	75	10.69	11.19	12.93	12.93	12.19
	90					

UNMASKED/DIM Instrument readings 9 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	67	63	64	50	52
e	5	59	60	57	50	52
r	10	64	62	64	50	52
t	15	68	66	64	50	52
	20	62	66	62	50	52
BOT	30	58	61	60	51	53
	40	53	58	56	53	53
	75	52	46	54	54	52
	90					

candle power values

d=15.77083'		CW horizontal angle 0	20	40	60	70
v	0	16.66	15.67	15.92	12.44	12.93
e	5	14.67	14.92	14.18	12.44	12.93
r	10	15.92	15.42	15.92	12.44	12.93
t	15	16.91	16.42	15.92	12.44	12.93
	20	15.42	16.42	15.42	12.44	12.93
BOT	30	14.43	15.17	14.92	12.68	13.18
	40	13.18	14.43	13.93	13.18	13.68
	75	12.93	11.44	13.43	13.43	12.93
	90					

UNMASKED/DIM Instrument readings 11 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	62	56	55	48	49
e	5	64	60	56	48	49
r	10	59	61	54	48	49
t	15	57	56	58	47	49
	20	53	51	56	48	50
TOP	30	53	51	54	49	51
	40	51	50	50	51	52
	75	40	42	52	51	48
	90					

candle power values

d=15.72917'		CW horizontal angle 0	20	40	60	70
v	0	15.34	13.85	13.61	11.88	12.12
e	5	15.83	14.84	13.85	11.88	12.12
r	10	14.60	15.09	13.36	11.88	12.12
t	15	14.10	13.85	14.35	11.63	12.12
	20	13.11	12.62	13.85	11.88	12.37
TOP	30	13.11	12.62	13.36	12.12	12.62
	40	12.62	12.37	12.37	12.62	12.87
	75	9.90	10.39	12.87	12.62	11.88
	90					

UNMASKED/DIM Instrument readings 11 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	58	57	57	46	50
e	5	56	54	58	46	51
r	10	55	56	56	47	52
t	15	50	54	54	48	52
	20	52	56	58	49	52
BOT	30	52	51	55	49	52
	40	48	51	50	50	54
	75	42	43	52	51	43
	90					

candle power values

d=15.72917'		CW horizontal angle 0	20	40	60	70
v	0	14.35	14.10	14.10	11.38	12.37
e	5	13.85	13.36	14.35	11.38	12.62
r	10	13.61	13.85	13.85	11.63	12.87
t	15	12.37	13.36	13.36	11.88	12.87
	20	12.87	13.85	14.35	12.12	12.87
BOT	30	12.87	12.62	13.61	12.12	12.87
	40	11.88	12.62	12.37	12.37	13.36
	75	10.39	10.64	12.87	12.62	10.64
	90					

Instrument readings 9 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		57	64	50	52
e	5		59	57	51	52
r	10		57	60	52	52
t	15		58	60	54	52
	20		52	61	57	51
TOP	30		61	57	59	51
	40		55	55	59	47
	75		54	54	44	38
	90					

candle power values

d=15.77083'		CCW horizontal angle 0	20	40	60	70
v	0	0.00	14.18	15.92	12.44	12.93
e	5	0.00	14.67	14.18	12.68	12.93
r	10	0.00	14.18	14.92	12.93	12.93
t	15	0.00	14.43	14.92	13.43	12.93
	20	0.00	12.93	15.17	14.18	12.68
TOP	30	0.00	13.17	14.18	14.67	12.68
	40	0.00	13.68	13.68	14.67	11.69
	75	0.00	13.43	13.43	10.94	9.45
	90					

Instrument readings 9 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		60	58	56	58
e	5		66	64	54	58
r	10		66	61	54	58
t	15		64	61	55	59
	20		61	63	55	59
BOT	30		61	59	57	63
	40		57	54	58	65
	75		53	56	48	41
	90					

candle power values

d=15.77083'		CCW horizontal angle 0	20	40	60	70
v	0	0.00	14.92	14.43	13.93	14.43
e	5	0.00	16.42	15.92	13.43	14.43
r	10	0.00	16.42	15.17	13.43	14.43
t	15	0.00	15.92	15.17	13.68	14.67
	20	0.00	15.17	15.42	13.68	14.67
BOT	30	0.00	15.17	14.67	14.18	15.67
	40	0.00	14.18	13.43	14.43	16.17
	75	0.00	13.18	13.93	11.94	10.20
	90					

Instrument readings 11 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		55	54	47	48
e	5		53	57	47	49
r	10		61	58	48	49
t	15		59	57	49	48
	20		56	57	49	47
TOP	30		57	55	49	45
	40		55	51	51	43
	75		48	54	43	40
	90					

candle power values

d=15.72917'		CCW horizontal angle 0	20	40	60	70
v	0	0.00	13.61	13.36	11.63	11.88
e	5	0.00	13.11	14.10	11.63	12.12
r	10	0.00	15.09	14.35	11.88	12.12
t	15	0.00	14.60	14.10	12.12	11.88
	20	0.00	13.85	14.10	12.12	11.63
TOP	30	0.00	14.10	13.61	12.12	11.13
	40	0.00	13.61	12.62	12.62	10.64
	75	0.00	11.88	13.36	10.64	9.90
	90					

Instrument readings 11 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		55	59	49	48
e	5		56	50	50	48
r	10		55	59	49	48
t	15		55	56	49	48
	20		56	55	51	49
BOT	30		47	55	51	49
	40		53	52	52	49
	75		49	50	45	48
	90					

candle power values

d=15.72917'		CCW horizontal angle 0	20	40	60	70
v	0	0.00	13.61	14.60	12.12	11.88
e	5	0.00	13.85	12.37	12.37	11.88
r	10	0.00	13.61	14.60	12.12	11.88
t	15	0.00	13.61	13.85	12.12	11.88
	20	0.00	13.85	13.61	12.62	12.12
BOT	30	0.00	11.63	13.61	12.62	12.12
	40	0.00	13.11	12.87	12.87	12.12
	75	0.00	12.12	12.37	11.13	11.88
	90					

Table M-1c.

Measured data and calculated intensity values for tail position light bulb, multiple samples; bulbs #5 and 6. Intensity expressed in candelas.

UNMASKED/DIM — instrument readings — 11 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	60	59	54	48	50
e	5	60	58	54	47	49
r	10	58	59	55	47	50
t	15	56	56	56	46	49
	20	55	53	55	46	50
TOP	30	51	50	52	48	51
	40	49	48	49	50	51
	75	37	39	49	48	46
	90					

candle power values — d=15.72917' — CW horizontal angle

		0	20	40	60	70
v	0	14.84	14.60	13.36	11.88	12.37
e	5	14.84	14.35	13.36	11.63	12.12
r	10	14.35	14.60	13.61	11.63	12.37
t	15	13.85	13.85	13.85	11.38	12.12
	20	13.61	13.11	13.61	11.38	12.37
TOP	30	12.62	12.37	12.87	11.88	12.62
	40	12.12	11.88	12.12	12.37	12.62
	75	9.15	9.65	12.12	11.88	11.38
	90					

UNMASKED/DIM — instrument readings — 11 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	61	52	52	47	49
e	5	53	52	51	47	49
r	10	55	48	50	47	49
t	15	52	52	52	47	49
	20	50	54	52	47	48
BOT	30	50	50	53	48	49
	40	48	50	48	49	49
	75	38	39	48	49	46
	90					

candle power values — d=15.72917' — CW horizontal angle

		0	20	40	60	70
v	0	15.09	12.87	12.87	11.63	12.12
e	5	13.11	12.87	12.62	11.63	12.12
r	10	13.61	11.88	12.37	11.63	12.12
t	15	12.87	12.87	12.87	11.63	12.12
	20	12.37	13.36	12.87	11.63	11.88
BOT	30	12.37	12.37	13.11	11.88	12.12
	40	11.88	12.37	11.88	12.12	12.12
	75	9.40	9.65	11.88	12.12	11.38
	90					

UNMASKED/DIM — instrument readings — 16 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	63	53	50	47	50
e	5	59	54	48	46	49
r	10	55	53	51	47	50
t	15	53	54	57	48	51
	20	51	59	52	49	51
TOP	30	52	44	51	50	51
	40	50	41	47	49	51
	75	40	38	49	50	50
	90					

candle power values — d=15.72917' — CW horizontal angle

		0	20	40	60	70
v	0	15.59	13.11	12.37	11.63	12.37
e	5	14.60	13.36	11.88	11.38	12.12
r	10	13.61	13.11	12.62	11.63	12.37
t	15	13.11	13.36	14.10	11.88	12.62
	20	12.62	14.60	12.87	12.12	12.62
TOP	30	12.87	10.89	12.62	12.37	12.62
	40	12.37	10.14	11.63	12.12	12.62
	75	9.90	9.40	12.12	12.37	12.37
	90					

UNMASKED/DIM — instrument readings — 16 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0		59	56	46	48
e	5		61	55	46	48
r	10		58	60	47	49
t	15		58	55	47	49
	20		58	58	48	49
BOT	30		51	55	49	49
	40		54	50	51	49
	75		41	49	48	47
	90					

candle power values — d=15.72917' — CW horizontal angle

		0	20	40	60	70
v	0	0.00	14.60	13.85	11.38	11.88
e	5	0.00	15.09	13.61	11.38	11.88
r	10	0.00	14.35	14.84	11.63	12.12
t	15	0.00	14.35	13.61	11.63	12.12
	20	0.00	14.35	14.35	11.88	12.12
BOT	30	0.00	12.62	13.61	12.12	12.12
	40	0.00	13.36	12.37	12.62	12.12
	75	0.00	10.14	12.12	11.88	11.63
	90					

UNMASKED/DIM — instrument readings — 11 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		52	53	47	51
e	5		51	56	48	51
r	10		57	56	49	51
t	15		56	56	49	52
	20		57	56	49	51
TOP	30		52	54	50	49
	40		52	51	52	44
	75		47	51	42	39
	90					

candle power values — d=15.72917' — CCW horizontal angle

		0	20	40	60	70
v	0	0.00	12.87	13.11	11.63	12.62
e	5	0.00	12.62	13.85	11.88	12.62
r	10	0.00	14.10	13.85	12.12	12.62
t	15	0.00	13.85	13.85	12.12	12.87
	20	0.00	14.10	13.85	12.12	12.62
TOP	30	0.00	12.87	13.36	12.37	12.12
	40	0.00	12.87	12.62	12.87	10.89
	75	0.00	11.63	12.62	10.39	9.65
	90					

UNMASKED/DIM — instrument readings — 11 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		50	49	49	54
e	5		52	52	49	54
r	10		58	55	50	54
t	15		54	53	50	54
	20		53	53	51	53
BOT	30		55	52	52	54
	40		52	51	55	55
	75		47	51	44	41
	90					

candle power values — d=15.72917' — CCW horizontal angle

		0	20	40	60	70
v	0	0.00	12.37	12.12	12.12	13.36
e	5	0.00	12.87	12.87	12.12	13.36
r	10	0.00	14.35	13.61	12.37	13.36
t	15	0.00	13.36	13.11	12.37	13.36
	20	0.00	13.11	13.11	12.62	13.11
BOT	30	0.00	13.61	12.87	12.87	13.36
	40	0.00	12.87	12.62	13.61	13.61
	75	0.00	11.63	12.62	10.89	10.14
	90					

UNMASKED/DIM — instrument readings — 16 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		56	56	46	46
e	5		59	55	47	46
r	10		50	56	48	45
t	15		60	55	49	45
	20		56	55	50	45
TOP	30		55	54	52	45
	40		55	52	50	43
	75		48	53	42	37
	90					

candle power values — d=15.72917' — CCW horizontal angle

		0	20	40	60	70
v	0	0.00	13.85	13.85	11.38	11.38
e	5	0.00	14.60	13.61	11.63	11.38
r	10	0.00	12.37	13.85	11.88	11.13
t	15	0.00	14.84	13.61	12.12	11.13
	20	0.00	13.85	13.61	12.37	11.13
TOP	30	0.00	13.61	13.36	12.87	11.13
	40	0.00	13.61	12.87	12.37	10.64
	75	0.00	11.88	13.11	10.39	9.15
	90					

UNMASKED/DIM — instrument readings — 16 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		69	50	52	49	55
e	5		56	52	57	50	55
r	10		60	56	54	50	55
t	15		61	56	54	51	55
	20		55	55	55	51	55
BOT	30		53	54	54	53	55
	40		50	51	50	55	55
	75		40	47	51	45	42
	90						

candle power values — d=15.72917' — CCW horizontal angle

		0	20	40	60	70
v	0	17.07	12.37	12.87	12.12	13.61
e	5	13.85	12.87	14.10	12.37	13.61
r	10	14.84	13.85	13.36	12.37	13.61
t	15	15.09	13.85	13.36	12.62	13.61
	20	13.61	13.61	13.61	12.62	13.61
BOT	30	13.11	13.36	13.36	13.11	13.61
	40	12.37	12.62	12.37	13.61	13.61
	75	9.90	11.63	12.62	11.13	10.39
	90					

Table M-1d.

Measured data and calculated intensity values for tail position light bulb, multiple samples; bulbs #7 and 8. Intensity expressed in candelas.

UNMASKED/DIM Instrument readings 16 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	60	56	53	48	51
e	5	53	53	53	49	51
r	10	54	52	54	47	52
t	15	52	56	54	48	52
	20	51	54	54	47	51
TOP	30	52	51	49	48	51
	40	52	47	45	51	51
	75	41	36	55	59	45
	90					

candle power values

d=15.72917		CW horizontal angle 0	20	40	60	70
v	0	14.84	13.85	13.11	11.88	12.62
e	5	13.11	13.11	13.11	12.12	12.62
r	10	13.36	12.87	13.36	11.63	12.87
t	15	12.87	13.85	13.36	11.88	12.87
	20	12.62	13.36	13.36	11.63	12.62
TOP	30	12.87	12.62	12.12	11.88	12.62
	40	12.87	11.63	11.13	12.62	12.62
	75	10.14	8.91	13.61	14.60	11.13
	90					

UNMASKED/DIM Instrument readings 16 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	60	54	53	47	47
e	5	58	53	53	46	46
r	10	61	52	57	47	47
t	15	55	52	51	47	48
	20	53	55	55	48	48
BOT	30	53	51	53	49	49
	40	47	52	51	50	51
	75	38	41	51	51	49
	90					

candle power values

d=15.72917		CW horizontal angle 0	20	40	60	70
v	0	14.84	13.36	13.11	11.63	11.63
e	5	14.35	13.11	13.11	11.38	11.38
r	10	15.09	12.87	14.10	11.63	11.63
t	15	13.61	12.87	12.62	11.63	11.88
	20	13.11	13.61	13.61	11.88	11.88
BOT	30	13.11	12.62	13.11	12.12	12.12
	40	11.63	12.87	12.62	12.37	12.62
	75	9.40	10.14	12.62	12.62	12.12
	90					

UNMASKED/DIM Instrument readings 17 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	65	53	52	47	48
e	5	57	53	52	47	48
r	10	56	52	52	47	49
t	15	53	50	54	47	50
	20	51	51	52	47	51
TOP	30	50	51	50	48	51
	40	48	46	46	50	51
	75	39	39	49	49	47
	90					

candle power values

d=15.73958		CW horizontal angle 0	20	40	60	70
v	0	16.10	13.63	12.88	11.64	11.89
e	5	14.12	13.13	12.88	11.64	11.89
r	10	13.87	12.88	12.88	11.64	12.14
t	15	13.13	12.39	13.38	11.64	12.39
	20	12.63	12.63	12.88	11.64	12.63
TOP	30	12.39	12.63	12.39	11.89	12.63
	40	11.89	11.40	11.40	12.39	12.63
	75	9.66	9.66	12.14	12.14	11.64
	90					

UNMASKED/DIM Instrument readings 17 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	52	56	51	45	53
e	5	53	52	53	45	54
r	10	54	54	54	44	54
t	15	50	55	54	45	55
	20	50	53	52	45	55
BOT	30	48	51	52	47	54
	40	46	49	49	49	52
	75	36	40	48	48	31
	90					

candle power values

d=15.73958		CW horizontal angle 0	20	40	60	70
v	0	12.88	13.87	12.63	11.15	13.13
e	5	13.13	12.88	13.13	11.15	13.38
r	10	13.38	13.38	13.38	10.90	13.38
t	15	12.39	13.63	13.38	11.15	13.63
	20	12.39	13.13	12.88	11.15	13.63
BOT	30	11.89	12.63	12.88	11.64	13.38
	40	11.40	12.14	12.14	12.14	12.88
	75	8.92	9.91	11.89	11.89	7.68
	90					

Instrument readings 16 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		51	51	46	47
e	5		50	53	47	48
r	10		59	53	48	48
t	15		56	54	50	49
	20		55	54	50	48
TOP	30		55	54	51	46
	40		56	50	51	42
	75		50	53	40	41
	90					

candle power values

d=15.72917		CCW horizontal angle 0	20	40	60	70
v	0	0.00	12.62	12.62	11.38	11.63
e	5	0.00	12.37	13.11	11.63	11.88
r	10	0.00	14.60	13.11	11.88	11.88
t	15	0.00	13.85	13.36	12.37	12.12
	20	0.00	13.61	13.36	12.37	11.88
TOP	30	0.00	13.61	13.36	12.62	11.38
	40	0.00	13.85	12.37	12.62	10.39
	75	0.00	12.37	13.11	9.90	10.14
	90					

Instrument readings 16 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		51	55	52	57
e	5		58	58	53	57
r	10		59	55	53	58
t	15		56	55	53	58
	20		57	54	54	58
BOT	30		52	53	54	57
	40		50	49	56	55
	75		49	53	47	40
	90					

candle power values

d=15.72917		CCW horizontal angle 0	20	40	60	70
v	0	0.00	12.62	13.61	12.87	14.10
e	5	0.00	14.35	14.35	13.11	14.10
r	10	0.00	14.60	13.61	13.11	14.35
t	15	0.00	13.85	13.61	13.11	14.35
	20	0.00	14.10	13.36	13.36	14.35
BOT	30	0.00	12.87	13.11	13.36	14.10
	40	0.00	12.37	12.12	13.85	13.61
	75	0.00	12.12	13.11	11.63	9.90
	90					

Instrument readings 17 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		52	53	49	47
e	5		60	50	49	48
r	10		56	51	49	47
t	15		53	51	49	46
	20		53	52	48	44
TOP	30		52	50	47	43
	40		51	48	49	43
	75		46	50	41	32
	90					

candle power values

d=15.73958		CCW horizontal angle 0	20	40	60	70
v	0	0.00	12.88	13.13	12.14	11.64
e	5	0.00	14.86	12.39	12.14	11.89
r	10	0.00	13.87	12.63	12.14	11.64
t	15	0.00	13.13	12.63	12.14	11.40
	20	0.00	13.13	12.88	11.89	10.90
TOP	30	0.00	12.88	12.39	11.64	10.65
	40	0.00	12.63	11.89	12.14	10.65
	75	0.00	11.40	12.39	10.16	7.93
	90					

Instrument readings 17 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		49	53	50	48
e	5		52	50	51	47
r	10		52	53	52	47
t	15		51	53	52	47
	20		52	52	52	47
BOT	30		50	50	53	48
	40		48	49	53	48
	75		45	49	40	45
	90					

candle power values

d=15.73958		CCW horizontal angle 0	20	40	60	70
v	0	0.00	12.14	13.13	12.39	11.89
e	5	0.00	12.88	12.39	12.63	11.64
r	10	0.00	12.88	13.13	12.88	11.64
t	15	0.00	12.63	13.13	12.88	11.64
	20	0.00	12.88	12.88	12.88	11.64
BOT	30	0.00	12.39	12.39	13.13	11.89
	40	0.00	11.89	12.14	13.13	11.89
	75	0.00	11.15	12.14	9.91	11.15
	90					

Table M-1e.

Measured data and calculated intensity values for tail position light bulb, multiple samples; bulbs #9 and 11. Intensity expressed in candelas.

UNMASKED/DIM Instrument readings 17 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	56	52	57	49	53
e	5	54	55	55	50	53
r	10	52	57	57	50	52
t	15	52	56	57	50	52
	20	54	51	58	49	52
TOP	30	52	52	53	50	52
	40	54	50	50	52	53
	75	40	40	47	49	46
	90					

candle power values

d=15.72917'		CW horizontal angle 0	20	40	60	70
v	0	13.85	12.87	14.10	12.12	13.11
e	5	13.36	13.61	13.61	12.37	13.11
r	10	12.87	14.10	14.10	12.37	12.87
t	15	12.87	13.85	14.10	12.37	12.87
	20	13.36	12.62	14.35	12.12	12.87
TOP	30	12.87	12.87	13.11	12.37	12.87
	40	13.36	12.37	12.37	12.87	13.11
	75	9.90	9.90	11.63	12.12	11.38
	90					

UNMASKED/DIM Instrument readings 17 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0		54	54	46	45
e	5		54	55	47	46
r	10		53	57	48	46
t	15		53	54	47	47
	20		56	56	47	48
BOT	30		53	53	47	48
	40		51	50	47	48
	75		39	47	48	47
	90					

candle power values

d=15.72917'		CW horizontal angle 0	20	40	60	70
v	0	0.00	13.36	13.36	11.38	11.13
e	5	0.00	13.36	13.61	11.63	11.38
r	10	0.00	13.11	14.10	11.88	11.38
t	15	0.00	13.11	13.36	11.63	11.63
	20	0.00	13.85	13.85	11.63	11.88
BOT	30	0.00	13.11	13.11	11.63	11.88
	40	0.00	12.62	12.37	11.63	11.88
	75	0.00	9.65	11.63	11.88	11.63
	90					

UNMASKED/DIM Instrument readings 18 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	62	53	51	47	47
e	5	61	56	55	47	47
r	10	54	55	52	47	48
t	15	56	51	50	46	47
	20	52	48	52	45	47
TOP	30	50	48	50	46	47
	40	47	46	48	48	48
	75	36	39	49	51	49
	90					

candle power values

d=15.72917'		CW horizontal angle 0	20	40	60	70
v	0	15.34	13.11	12.62	11.63	11.63
e	5	15.09	13.85	13.61	11.63	11.63
r	10	13.36	13.61	12.87	11.63	11.88
t	15	13.85	12.62	12.37	11.38	11.63
	20	12.87	11.88	12.87	11.13	11.63
TOP	30	12.37	11.88	12.37	11.38	11.63
	40	11.63	11.38	11.88	11.88	11.88
	75	8.91	9.65	12.12	12.62	12.12
	90					

UNMASKED/DIM Instrument readings 18 Feb. 1993

		CW horizontal angle 0	20	40	60	70
v	0	57	56	55	46	48
e	5	55	56	55	46	48
r	10	56	53	54	47	48
t	15	53	57	53	47	47
	20	55	57	56	47	47
BOT	30	54	53	53	48	47
	40	51	52	50	49	48
	75	42	43	51	52	47
	90					

candle power values

d=15.72917'		CW horizontal angle 0	20	40	60	70
v	0	14.10	13.85	13.61	11.38	11.88
e	5	13.61	13.85	13.61	11.38	11.88
r	10	13.85	13.11	13.36	11.63	11.88
t	15	13.11	14.10	13.11	11.63	11.63
	20	13.61	14.10	13.85	11.63	11.63
BOT	30	13.36	13.11	13.11	11.88	11.63
	40	12.62	12.87	12.37	12.12	11.88
	75	10.39	10.64	12.62	12.87	11.63
	90					

UNMASKED/DIM Instrument readings 17 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		51	55	48	48
e	5		58	57	48	49
r	10		54	57	49	49
t	15		55	56	49	50
	20		58	54	51	50
TOP	30		56	52	53	50
	40		55	52	53	48
	75		50	52	41	33
	90					

candle power values

d=15.72917'		CCW horizontal angle 0	20	40	60	70
v	0	0.00	12.62	13.61	11.88	11.88
e	5	0.00	14.35	14.10	11.88	12.12
r	10	0.00	13.36	14.10	12.12	12.12
t	15	0.00	13.61	13.85	12.12	12.37
	20	0.00	14.35	13.36	12.62	12.37
TOP	30	0.00	13.85	12.87	13.11	12.37
	40	0.00	13.61	12.87	13.11	11.88
	75	0.00	12.37	12.87	10.14	8.16
	90					

UNMASKED/DIM Instrument readings 17 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0	62	49	55	52	54
e	5	54	53	60	51	54
r	10	58	58	54	51	54
t	15	57	55	56	52	55
	20	54	57	56	53	55
BOT	30	53	56	54	55	55
	40	49	55	52	55	52
	75	37	48	50	38	31
	90					

candle power values

d=15.72917'		CCW horizontal angle 0	20	40	60	70
v	0	15.34	12.12	13.61	12.87	13.36
e	5	13.36	13.11	14.84	12.62	13.36
r	10	14.35	14.35	13.36	12.62	13.36
t	15	14.10	13.61	13.85	12.87	13.61
	20	13.36	14.10	13.85	13.11	13.61
BOT	30	13.11	13.85	13.36	13.61	13.61
	40	12.12	13.61	12.87	13.61	12.87
	75	9.15	11.98	12.37	9.40	7.67
	90					

UNMASKED/DIM Instrument readings 18 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		53	53	47	47
e	5		53	58	48	47
r	10		58	56	48	47
t	15		57	56	48	47
	20		56	55	48	46
TOP	30		56	54	49	44
	40		54	52	52	41
	75		47	51	42	39
	90					

candle power values

d=15.72917'		CCW horizontal angle 0	20	40	60	70
v	0	0.00	13.11	13.11	11.63	11.63
e	5	0.00	13.11	14.35	11.88	11.63
r	10	0.00	14.35	13.85	11.88	11.63
t	15	0.00	14.10	13.85	11.88	11.63
	20	0.00	13.85	13.61	11.88	11.38
TOP	30	0.00	13.85	13.36	12.12	10.89
	40	0.00	13.36	12.87	12.87	10.14
	75	0.00	11.63	12.62	10.39	9.65
	90					

UNMASKED/DIM Instrument readings 18 Feb. 1993

		CCW horizontal angle 0	20	40	60	70
v	0		48	49	48	51
e	5		51	53	49	52
r	10		57	57	49	52
t	15		55	55	50	53
	20		55	54	51	53
BOT	30		48	54	53	54
	40		57	53	53	55
	75		49	52	44	44
	90					

candle power values

d=15.72917'		CCW horizontal angle 0	20	40	60	70
v	0	0.00	11.88	12.12	11.88	12.62
e	5	0.00	12.62	13.11	12.12	12.87
r	10	0.00	14.10	14.10	12.12	12.87
t	15	0.00	13.61	13.61	12.37	13.11
	20	0.00	13.61	13.36	12.62	13.11
BOT	30	0.00	11.88	13.36	13.11	13.36
	40	0.00	14.10	13.11	13.11	13.61
	75	0.00	12.12	12.87	10.89	10.89
	90					

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Bethesda, MD 20814-5044

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Fort Detrick, Frederick, MD 21702-5012

Director
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HQ DA (DASG-PSP-O)
5109 Leesburg Pike
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Director, Biological
Sciences Division
Office of Naval Research
600 North Quincy Street
Arlington, VA 22217

Commander
U.S. Army Materiel Command
ATTN: AMCDE-XS
5001 Eisenhower Avenue
Alexandria, VA 22333

Commandant
U.S. Army Aviation
Logistics School ATTN: ATSQ-TDN
Fort Eustis, VA 23604

Headquarters (ATMD)
U.S. Army Training
and Doctrine Command
ATTN: ATBO-M
Fort Monroe, VA 23651

IAF Liaison Officer for Safety
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Kirtland Air Force Base
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Henry L. Taylor
Director, Institute of Aviation
University of Illinois-Willard Airport
Savoy, IL 61874

Chief, National Guard Bureau
ATTN: NGB-ARS (COL Urbauer)
Room 410, Park Center 4
4501 Ford Avenue
Alexandria, VA 22302-1451

Commander
U.S. Army Aviation Systems Command
ATTN: SGRD-UAX-AL
4300 Goodfellow Blvd., Building 105
St. Louis, MO 63120

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4300 Goodfellow Boulevard
St. Louis, MO 63120

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U.S. Army Academy
of Health Sciences
ATTN: Library
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ATTN: SGRD-USM (Jan Duke)
Fort Sam Houston, TX 78234-6200

AAMRL/HEX
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Air Force Base, OH 45433

John A. Dellinger,
Southwest Research Institute
P. 0. Box 28510
San Antonio, TX 78284

Product Manager
Aviation Life Support Equipment
ATTN: AMCPM-ALSE
4300 Goodfellow Boulevard
St. Louis, MO 63120-1798

Commander and Director
USAE Waterways Experiment Station
ATTN: CEWES-IM-MI-R
Alfrieda S. Clark, CD Department
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

Commanding Officer
Naval Biodynamics Laboratory
P.O. Box 24907
New Orleans, LA 70189-0407

Assistant Commandant
U.S. Army Field Artillery School
ATTN: Morris Swott Technical Library
Fort Sill, OK 73503-0312

Mr. Peter Seib
Human Engineering Crew Station
Box 266
Westland Helicopters Limited
Yeovil, Somerset BA20 2YB UK

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Dr. Diane Damos
Department of Human Factors
ISSM, USC
Los Angeles, CA 90089-0021

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Ames Research Center
MS 262-3
Moffett Field, CA 94035

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Fort Sam Houston, TX 78234-6000

U. S. Army Research Institute
Aviation R&D Activity
ATTN: PERI-IR
Fort Rucker, AL 36362

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U.S. Army Safety Center
Fort Rucker, AL 36362

U.S. Army Aircraft Development
Test Activity
ATTN: STEBG-MP-P
Cairns Army Air Field
Fort Rucker, AL 36362

Commander, U.S. Army Medical Research
and Development Command
ATTN: SGRD-PLC (COL Schnakenberg)
Fort Detrick, Frederick, MD 21702

TRADOC Aviation LO
Unit 21551, Box A-209-A
APO AE 09777

Netherlands Army Liaison Office
Building 602
Fort Rucker, AL 36362

British Army Liaison Office
Building 602
Fort Rucker, AL 36362

Italian Army Liaison Office
Building 602
Fort Rucker, AL 36362

Directorate of Training Development
Building 502
Fort Rucker, AL 36362

Chief
USAHEL/USAAVNC Field Office
P. O. Box 716
Fort Rucker, AL 36362-5349

Commander, U.S. Army Aviation Center
and Fort Rucker
ATTN: ATZQ-CG
Fort Rucker, AL 36362

Chief
Test & Evaluation Coordinating Board
Cairns Army Air Field
Fort Rucker, AL 36362

MAJ Terry Newman
Canadian Army Liaison Office
Building 602
Fort Rucker, AL 36362

German Army Liaison Office
Building 602
Fort Rucker, AL 36362

LTC Patrice Cottebrune
French Army Liaison Office
USAAVNC (Building 602)
Fort Rucker, AL 36362-5021

Australian Army Liaison Office
Building 602
Fort Rucker, AL 36362

Dr. Garrison Rapmund
6 Burning Tree Court
Bethesda, MD 20817

Commandant, Royal Air Force
Institute of Aviation Medicine
Farnborough, Hampshire GU14 6SZ UK

Commander
U.S. Army Biomedical Research
and Development Laboratory
ATTN: SGRD-UBZ-I
Fort Detrick, Frederick, MD 21702

Defense Technical Information
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Alexandra, VA 22304-6145

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and Technology Center
AIFRTA (Davis)
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Charlottesville, VA 22901-5396

Director,
Applied Technology Laboratory
USARTL-AVSCOM
ATTN: Library, Building 401
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Commander, U.S. Air Force
Development Test Center
101 West D Avenue, Suite 117
Eglin Air Force Base, FL 32542-5495

Aviation Medicine Clinic
TMC #22, SAAF
Fort Bragg, NC 28305

Dr. H. Dix Christensen
Bio-Medical Science Building, Room 753
Post Office Box 26901
Oklahoma City, OK 73190

Commander, U.S. Army Missile
Command
Redstone Scientific Information Center
ATTN: AMSMI-RD-CS-R
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Director
Army Personnel Research Establishment
Farnborough, Hants GU14 6SZ UK

U.S. Army Research and Technology
Laboratories (AVSCOM)
Propulsion Laboratory MS 302-2
NASA Lewis Research Center
Cleveland, OH 44135

COL John F. Glenn
U.S. Army Medical Research
& Development Command
SGRD-ZC
Fort Detrick, Frederick, MD 21702-5012

Dr. Eugene S. Channing
7985 Schooner Court
Frederick, MD 21701-3273

USAMRDC Liaison at Academy
of Health Sciences
ATTN: HSHA-ZAC-F
Fort Sam Houston, TX 78234

Dr. A. Kornfield, President
Biosearch Company
3016 Revere Road
Drexel Hill, PA 29026

NVEOD
AMSEL-RD-ASID
(Attn: Trang Bui)
Fort Belvior, VA 22060

CA Av Med
HQ DAAC
Middle Wallop
Stockbridge, Hants S020 8DY UK

Dr. Christine Schlichting
Behavioral Sciences Department
Box 900, NAVUBASE NLON
Groton, CT 06349-5900

Brazilian Army Liaison Office
Building 602
Fort Rucker, AL 36362

COL C. Fred Tyner
U.S. Army Medical Research
& Development Command
SGRD-ZB
Fort Detrick, Frederick, MD 21702-5012

Director
Directorate of Combat Developments
ATZQ-CD
Building 515
Fort Rucker, AL 36362