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The Engineering Resource For Advancing Mobility

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AEROSPACE RECOMMENDED PRACTICE

ARP 1283

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Revised

CARGO COMPARTMENT LIGHTING FOR TRANSPORT CATEGORY AIRCRAFT AND ROTORCRAFT

1. PURPOSE: The purpose of this Aerospace Recommended Practice (ARP) is to establish design guidance for adequate and safe cargo compartment and cargo access lighting systems. The adoption of a standard set of illumination values found appropriate for the performance of the task in specified areas should expedite ground handling and improve flight and ground safety.

2. METHODS OF LIGHTING Human factors studies of cargo compartments indicate that a general illumination level of 8 ft. candles (86 lux) is adequate for inspection of tie-down nets, bulk carrier latches, etc., when the loading personnel are sufficiently adapted to low level ambient illumination. In the current state of the art, an area of about 20 square feet (4.5 x 4.5) (1.4 m x 1.4 m) can be illuminated to this level per pound of system weight using incandescent lamps and a lens reflector system. In medium-size or large aircraft, a sufficient number of lamps and fixtures should be used to reduce light blockage to a minimum and enable handling personnel in any of the various cargo loading possibilities to see each tie down and latch mechanism. An incandescent lamp system using step down transformers and low voltage tungsten lamps has a minimum chance of producing radio noise (EMI). Lamp life per flight hour may be low and lamp maintenance may be high because the system remains illuminated on the ground most of the time. It is recommended that tungsten lamps in a low voltage system be of the long life type, preferable selected from SAE ARP 881, Lamps For Aircraft Lighting. Aircraft fluorescent systems are somewhat more efficient than tungsten for space illumination. While fluorescent lamp life is much greater, the long tubular shape makes the fluorescent lamp more vulnerable to damage. Fixture design must consider lamp protection. The light from a typical fluorescent luminaire is much more likely to be blocked by loaded cargo.

Particular consideration must be given to fluorescent illuminating systems that are used in low ambient temperatures. Specially designed ballasts are needed to start cold lamps and appropriately designed fixtures are necessary for starting and operating at subfreezing temperatures. It has been found that specially design systems can operate at reduced efficiency down to -40°F (-40°C). Some systems will not operate below 20°F (-7°C). At ambient temperatures below freezing lamp efficiency is lower and some lamps may not start at all.

3. CARGO COMPARTMENTS: Cargo compartments may be broken into two broad categories as follows:

(a) Large main deck loads, restrained by tie downs, nets, and package containers mounted to the floor or rails.

(b) Small sub-deck loads, restrained in lined compartments such as used with suitcases, boxes and mail bags.

4. CARGO COMPARTMENT LIGHTING:

4.1 Large Compartments or Main Decks: Each cargo floor, latch, tie down, ring, or load holding device shall be illuminated to the levels as shown in Table I. Lighting provided for fittings and latches may serve as dual function lighting. The illumination level at any latch, tie down or device that is obscured by the cargo and not in use need not meet this requirement.

4.1.1 Control- Off-On Main Deck: Off-On controls shall be provided at the location where flight and loading crews would enter the compartment. Additional Off-On controls may be provided at convenient locations in the cargo compartment near the loading areas.

TABLE I

CARGO AREAS	RECOMMENDED ILLUMINATION LEVELS			
	Nominal		Minimum	
Main Deck	Foot Candles	(lux)	Foot Candles	(lux)
Cargo Tie Locks	8-10	(86 - 108)	8 Unloaded	(86)
			2 Loaded	
Entire Floor	8	(86)	5	(54)

4.1.2 Maintenance: Fixtures shall be designed to avoid damage by cargo loading or shifting in flight. Preferably the maximum protection should be obtained from the main structure but guards or shields may supplement the other structural protection. Ready access should be provided to facilitate lamp replacement. The lighting system for the cargo compartments shall be of a design that will preclude its being a source of ignition or fire propagation. If combustible materials are to be transported, special drainage and venting may be required in these areas, and explosion proof luminaries may be required. To facilitate maintenance the use of only one type of lamp throughout a compartment or compartments is highly desirable.

4.2 Cargo Compartment Lighting - Sub-Deck or Small Compartments: Illumination of five foot-candles (54 lux) at the floor level shall be provided with a minimum of two foot-candles (22 lux). Lights shall be controlled by a manual switch and a door-actuated switch, or touchdown-actuated control, which will operate in series with manual switch.

5. AIRCRAFT LOADING RAMP AND/OR BAGGAGE CONVEYOR: Illumination levels of eight foot-candles (86 lux) and a minimum of five foot-candles (54 lux) are recommended at twenty feet (6 m) from the door threshold on the plane of the cargo compartment floor and across the width of the loading door on the side of the aircraft from which it is to be loaded. Light spread shall be sufficient to read baggage tags at the end of the loading conveyor and ten feet (3 m) laterally on either side of the loading door or ramp.

5.1 Loading Door and/or Hatch Lighting: Eight (8) foot-candles (86 lux) or more shall be provided for hatches and/or loading doors used for containerized baggage loading. Light fixtures shall be so located that they will not be blocked by the container or loading vehicle.

5.2 Maintenance: Higher intensities and extended lamp life are desirable and may dictate the use of quartz lamps in a compatible fixture or even a sealed beam quartz lamp in a suitable fixture as previously stated, however, an extended life standard incandescent lamp should be specified when possible. Consideration should be given to operation of incandescent lamps, and/or quartz lamps at reduced voltage to achieve improvement in lamp life.

5.3 Controls: An Off-On switch readily accessible to the ramp loading crew shall be provided adjacent to the loading door for these loading ramp lights. A door-actuated switch shall also be provided, in series with the manual switch, to ensure that door-mounted luminaries cannot be turned on until the cargo door is at the fully open position, to ensure that displaced baggage cannot be damaged by heat from the lamps.

6. SAFETY: Systems that employ high intensity lamps such as those that use reflector lens combinations producing high radiant energy densities near the lamp shall be so installed that the radiant heat of the light beam will not destroy trim or create a fire hazard regardless of whether a fixture is open for relamping or is in its normal operating condition. Potentially a radiant energy concentration may take place several inches away from the lamp dangerously raising the temperature of combustible or heat deformable material in the cargo or plane structure.

Care must be taken, in the design of the lighting installation and its switching circuit, to minimize this possibility of radiant heat damage to anything in the area. The cargo provisions must be made to maintain adequate space between fixtures and the cargo, assure adequate luminaire ventilation, and to turn off the lighting system when the loading task is completed.