FEDERAL AVIATION AGENCY
FLIGHT STANDARDS SERVICE
Washington 25, D. C.

February 20, 1963

CIVIL AIR REGULATIONS DRAFT RELEASE NO. 63-7

SUBJECT: Proposed Revision of the Exterior Lighting Regulations in the Airworthiness Parts and the Operating Parts of the Civil Air Regulations

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The Flight Standards Service of the Federal Aviation Agency has under consideration a group of amendments to Parts 3, 4b, 6, 7, 40, 41, 42, 43, 46, and 47 (recodified FAR 125 /New/) of the Civil Air Regulations affecting the exterior lighting regulations they contain. The reasons therefor are set forth in the explanatory statement of the attached proposal which is being published in the Federal Register as a notice of proposed rule making.

The Flight Standards Service desires that all persons who will be affected by the requirements of this proposal be fully informed as to its effect upon them and is therefore circulating copies in order to afford interested persons ample opportunity to submit comments as they may desire.

Because of the large number of comments which we anticipate receiving in response to this draft release, we will be unable to acknowledge receipt of each reply. However, you may be assured that all comment will be given careful consideration.

It should be noted that comments should be submitted in duplicate to the Docket Section of the Federal Aviation Agency, and in order to insure consideration should be received on or before May 29, 1963.

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Director,
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FEDERAL AVIATION AGENCY

FLIGHT STANDARDS SERVICE

[14 CFR Parts 3, 4b, 6, 7, 40, 41, 42, 43, 46]

[Regulatory Docket No. 1617; Draft Release No. 63–7]

NOTICE OF PROPOSED RULE MAKING

Proposed Revision of the Exterior Lighting Regulations in the Airworthiness Parts and Operating Parts of the Civil Air Regulations

Notice is hereby given that there is under consideration a proposal to amend the exterior lighting provisions in Parts 3, 4b, 6, 7, 40, 41, 42, 43, and 46 of the Civil Air Regulations and those in Part 47 (recodified FAR 125 [New]) at such time as this part becomes effective. The proposed amendments prescribe: (1) an anticollision light system which differs from that currently prescribed in both configuration and performance; and (2) certain provisions dealing with supplementary lights. Aircraft manufacturers, aircraft lighting fixture manufacturers, and all persons who operate aircraft may be affected by these proposed amendments.

Interested persons may participate in the making of the proposed rules by submitting such written data, views, or arguments as they may desire. Communications should be submitted in duplicate to the Docket Section of the Federal Aviation Agency, Room A–103, 1711 New York Avenue, N.W., Washington 25, D.C. All communications received on or before May 29, 1963, will be considered by the Administrator before taking action upon the proposed rules. The proposals contained in this notice may be changed in the light of comments received. All comments will be available in the Docket Section for examination by interested persons at any time.

The currently effective exterior lighting provisions in Parts 3, 4b, 6, and 7 prescribe the following: (1) a position light system consisting of three steady colored lights (red, green, and white) which form the familiar three-sector color code that has been used for many years in aviation; and (2) an anticollision light system consisting of one or more red high-intensity flashing lights displayed in all three position light sectors.

These provisions were adopted by the Civil Aeronautics Board on February 25, 1957, after the lighting system had been voluntarily installed on numerous aircraft under the terms of then effective SR-392A and predecessor Special Civil Air Regulations. Recognizing that further lighting experimentation might result in the development of still more effective systems, the CAB concurrently adopted SR-392B (superseding SR-392A) which permitted operators to continue experiments with non-standard exterior lighting configurations on aircraft with standard airworthiness certificates. SR-392B has since been superseded by SR-392C (effective February 3, 1962), which in turn has been superseded by SR-392D (effective June 25, 1962).

Private persons have conducted various exterior lighting experiments over the years, designed primarily to improve anticollision light system performance. These experiments led to the development of several anticollision light systems which differ in important respects from that currently prescribed. Of significance from the rule making standpoint were the following:

Anticollision Light System #1: A longitudinal array of white high-intensity lights, flashing in a forward-moving sequence.

Anticollision Light System #2: A flash-frequency-coded array of white high-intensity flashing lights which distinguishes between forward, sideward, and rearward sectors disposed symmetrically about the longitudinal axis of the aircraft.

Anticollision Light System #3: A color-coded array of high-intensity flashing lights, utilizing the same colors, and illuminating the same sectors, as the currently prescribed position lights.

Anticollision Light System #4: A system identical to the currently prescribed anticollision light system, except that the color is white rather than red.

Urged by proponents of these anticollision light systems to adopt one of them as a new standard, the CAB undertook a further evaluation of the exterior lighting requirements during 1958. The CAB's evaluation culminated in a notice of proposed rule making contained in Draft Release No. 58–15 and published in the FEDERAL REGISTER, July 30, 1958 (23 F.R. 5996). Among other things, the notice of proposed rule making proposed that Parts 3, 4b, 6, and 7 be amended to permit the installation of a new anticollision light system (system #3, outlined previously) as an alternative to the currently prescribed system.

The comments received in response to Draft Release 58–15 reflected sharply divided views among numerous interested perrsons; and the CAB therefore convened a government-industry meeting, on November 3 and 4, 1958, to assist in resolving the issues. With respect to the anticollision light issue,

discussions at the meeting made it clear that, although many held the view that the currently effective anticollision light requirements should be upgraded, there was insufficient evidence to support the designation of any one system as a new standard. A representative of the newly formed Federal Aviation Agency attending the meeting announced that the Agency planned a program of intensive research in the exterior lighting field in order to: (1) develop a yardstick with which to properly evaluate new lighting systems; (2) determine which of the previously described anticollision light systems warrants adoption as an "interim" standard; and (3) evolve an "optimum" exterior lighting system which would become the final standard. Pending completion of the forthcoming FAA research, the CAB withheld the action proposed in Draft Release 58-15; and, late in 1958, authority to promulgate Civil Air Regulations passed from the CAB to this Agency in accordance with the provisions of the Federal Aviation Act of 1958.

The Agency's exterior lighting research program, begun in mid-1959, included a searching investigation of the "interim" anticollision light system question. No conclusive evidence was found to support the contention that the collision-avoidance capability inherent in any of the previously described systems was superior to that of the currently prescribed anticollision light system at comparable intensity levels. Navy Department tests designed to resolve the same question arrived at a similar conclusion. The Agency also reviewed reports submitted to date by private experimenters describing their experimental findings; but for the most part these reports contained subjective evaluations of the proposed anticollision light systems without the use of experimental controls to insure a valid basis for comparison. The evidence again was not conclusive.

Research directed toward the development of an "optimum" exterior lighting system is still under way. Many approaches are possible, but the most promising appears to be a configuration which signals altitude information in addition to the information now provided. Several complex technical and human engineering problems remain to be solved, however, such that there appears to be little prospect for early completion of this program. Additional research is being applied to determine whether a four-sector position light system would be significantly superior to the currently prescribed system; and whether it is feasible to define four colors which can be easily distinguished from each other in aircraft service. Neither of these research efforts has matured sufficiently to be considered a factor in the present regulatory situation.

In the course of the Agency's study of the present need for regulatory action concerning exterior lighting requirements several important factors emerged:

(a) Dating from the promulgation of the currently effective exterior lighting regulations in 1957, hundreds of turbine-powered airplanes, operating at considerably higher speeds than previous airplane types, have been placed in service; and the number of aircraft miles flown by civil aircraft has increased steadily, indicating a corresponding increase in air traffic density. This trend to higher speeds and greater traffic density is expected to continue into the future, leading to an increased probability of in-flight collision during night operations unless compensating measures are taken to improve exterior lighting standards.

(b) Although it could not be established conclusively that any of the proposed "interim" anticollision light systems was superior to the currently prescribed system at equivalent intensity levels, there appears to be general agreement that an increase in the range at which directional information is signalled would correspondingly improve collision avoidance capability. Of the previously described anticollision light systems, systems #1, #2, and #3 were designed to provide directional information at ranges far beyond the range of the currently prescribed position light system.

(c) The currently pescribed exterior lighting system has been diluted, and in many cases overwhelmed, by supplementary lights (i.e., lights in addition to those prescribed) which have been voluntarily installed on numerous aircraft. Certain of the previously described anticollision light systems have been approved in the past as supplementary lights on the basis that the currently effective exterior lighting regulations did not specifically prohibit the installation of nonprescribed lights. In particular, one major airline has fitted its fleet with anticollision light system #3 in addition to the prescribed exterior lighting system. Since these supplementary lights are generally more intense than those prescribed, they often constitute the major elements in the display and raise the question whether the prescribed elements might not be removed as superfluous. The net effect has been a drift away from the prescribed standard and a reduction of its usefulness as a collision-avoidance signal.

(d) The currently effective standards, prescribing steady position lights and red anticollision lights, effectively (although unintentionally) prevent the use of condenser-discharge lights in the prescribed system. The condenser-discharge light is inherently a flashing light, impossible to apply as a steady light; and most of its output energy is concentrated in the blue portion of the spectrum, such that the required red filter reduces its light output considerably. Adoption of a standard lighting system which can make effective use of condenser discharge lights will eliminate this unwarranted discrimination with respect to types of light sources.

In view of these considerations the Agency believes that there is good and sufficient reason to undertake rule making action now rather than to wait until the present research effort reaches fruition, perhaps in several years.

In particular, the Agency considers it necessary to prescribe an increase in exterior lighting system performance such that directional information is provided at intensity levels comparable to that currently prescribed for anticollision lights. This increase in

exterior lighting performance can best be attained, the Agency believes, by prescribing the anticollision light system designated previously as system #3 in lieu of the currently prescribed anticollision light system, while retaining the currently prescribed position light system. This action is proposed, in preference to other alternatives, on the following grounds: (1) the lighting display is simplest, combining the position light and anticollision light functions in a logical, easy-to-understand way; (2) the lighting display departs least from that currently prescribed and from those previously prescribed; (3) there would be minimum confusion during the transition period, since pilots are already familiar with the red, green, and white color code; (4) the required performance is attainable by locating lighting fixtures at the wingtips and tail, thereby providing full coverage without obstruction and with minimal backscatter effect on crew vision; (5) fixtures capable of the specified performance are available at reasonable cost for use on small aircraft, with an electrical current drain comparable to that required to comply with the present standards; and (6) condenser-discharge lights may be applied in the system.

Further, the Agency considers that supplementary lights, by adding extraneous signals to the standard display, promote confusion during night operations; and that the exterior lighting regulations should be amended to prohibit the installation of lights (for use at night) other than those specifically prescribed in currently effective or previously effective regulations.

The Agency does not believe, however, that the safety record covering night operations in recent years justified retroactive regulatory action with respect to exterior lighting provisions. Instead, it is proposed to achieve an orderly transition to a higher level of safety, without imposing a burden on present operators of aircraft, by taking the following regulatory action:

(1) *With respect to Parts 3, 4b, 6, and 7, by amending the currently effective regulations to:*

(a) Permit, until January 1, 1965, the type certification of aircraft fitted with either:

(i) The currently prescribed anticollision light system; or

(ii) An anticollision light system consisting of a high-intensity flashing light in each position light sector, having the same color as the corresponding position light, and complying with the currently prescribed flashing rate, intensity level, and intensity distribution standards for anticollision lights;

(b) Limit the currently prescribed position light system, and both anticollision light systems set forth in paragraph (1)(a), to exclude lights that are not specifically prescribed; and

(c) Require that all aircraft type certificated or manufactured after January 1, 1965, irrespective of the date of application for type certificate, comply with the anticollision light system requirements set forth in paragraph (1)(a)(ii) and with the limiting requirements of paragraph (1)(b).

(2) *With respect to Parts 49, 41, 42, 43, and 46, (and to Part 47 (recodified FAR 125 [New]) at such time as this part becomes effective) by amending the currrently effective regulations to:*

(a) Require that all new anticollision light systems installed after January 1, 1965, (on aircraft operated under the provisions of these parts) be in accordance with the requirements of paragraph (1)(a)(ii); and

(b) Prohibit, upon adoption of this rule, the *further* installation (on aircraft operated under the provisions of these parts) of exterior lights that are not specifically prescribed in the airworthiness regulations under which the aircraft was type certificated, or in subsequent amendments of these airworthiness regulations; except that further installation of such exterior lights, if approved under the terms of type certificates or supplemental type certificates issued prior to the date of adoption of this rule, will be permitted until January 1, 1965.

Concerning the use of lights during daylight hours, the Agency understands that extremely high intensities, relative to those now prescribed for anticollision lights, are necessary for any significant improvement in aircraft conspicuity over all daylight conditions. Lights capable of such performance appear impracticable, in view of their excessive weight, bulk, power consumption, and heat dissipation. However, lights of practical rating may have occasional value during the daytime, particularly near dawn and dusk. Although the evidence supporting the usefulness of such daytime lights for collision avoidance is not sufficient to warrant a mandatory requirement, the Agency wishes to encourage their use on a voluntary basis. To make it clear that lights (whether or not prescribed) may be displayed during the day, it is proposed to add a note to that effect in Parts 3, 4b, 6, and 7.

The Agency's research program on visual collision avoidance also included an evaluation of the effectiveness of high-visibility (fluorescent) paints for making aircraft more conspicuous during daylight hours. It was found that some exterior paint, in standardized patterns, is better than no paint; and that fluorescent paints are preferable to other paints. On the other hand, it is well known that fluorescent paint is expensive, difficult to apply, and requires frequent maintenance relative to conventional paints. After an evaluation of the increment of safety that might be attained by using standardized paint patterns and fluorescent paints on civil aircraft, the Agency concludes that a mandatory exterior paint requirement is not justified. Nevertheless, the Agency wishes to encourage the voluntary use of fluorescent paint and of optimum paint configurations.

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