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AEROSPACE RECOMMENDED PRACTICE

ARP 450B

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FLIGHT DECK VISUAL, AUDIBLE, AND TACTUAL SIGNALS

1. PURPOSE This ARP sets forth recommendations relative to flight deck visual, audible, and tactual signals. It is intended that, through the adoption of a standard set of visual, audible, and tactual signals within the flight deck, confusion will be reduced in regard to critical items, procedures, controls, and functions deemed important enough to warrant alerting the crew.

2. FLIGHT DECK SIGNALS

2.1 General Philosophy - Aircraft flight deck signal systems may consist of one or more of the signals herein defined.

Insofar as is technically feasible, it is desirable to prevent warning or caution signals from existing or occurring when not applicable in view of the basic intent or design aim of the signal system. This design philosophy is desirable in order to prevent a build-up of flight crew tolerance and disregard for the signal.

If the prime function of a master visual signal, or of one of the visual signals in an annunciator panel is to direct attention to an indicator or control device, it shall supplement a separate visual signal at that location. The individual visual signals used with master warning signals, master caution signals or annunciator panels, should be identified with transilluminated nomenclature.

2.1.1 Visual Signals - May consist of lights (with or without transilluminated nomenclature), warning flags or indicators, or, in the case of instrument indications, in the total removal of the pertinent instrument display.

2.1.1.1 Master Warning Light (s) - A master warning light is a light which is used where warning lights are located outside of the direct vision of either pilot.

NOTE: A master warning light or lights may be required because of the limitations of visibility of colored lights and the variability of lighting conditions in the flight deck.

2.1.1.2 Warning Lights - Lights provided to warn the crew member, or the crew, of a condition which requires immediate protective or corrective action.

2.1.1.3 Master Caution Light (s) - A master caution light is a light which is used where caution lights are located outside of the normal field of vision of either pilot.

2.1.1.4 Caution Lights - Lights provided to indicate malfunctions which do not require immediate action, but which cannot go unattended continuously without a more serious condition possibly developing.

2.1.1.5 Advisory Lights - Lights provided to indicate safe or normal configuration, condition of performance, operation of essential equipment, or for attracting attention for routine purposes.

2.1.1.6 Annunciator Panels - Collections of two or more visual signals in one or more convenient locations in the flight deck area and used to provide better readability and/or to release high priority locations for more valuable usage.

2.1.1.7 Warning Flags or Indicators - Mechanically or electrically actuated displays used to warn of an unsafe setting or malfunction of instruments or mechanical devices.

In the case of flight instruments, a warning flag should obscure the function indicators for which the warning is pertinent. If this is not possible, the flag shall be not less than 1/4 inch in width, nor less than 1/4 square inch in area.

2.1.2 Audible Signals

2.1.2.1 Warning Bell - A bell which operates in conjunction with a warning light only to indicate the existence of a fire.

2.1.2.2 Warning Horn - A horn which operates to indicate an unsafe configuration.

2.1.2.3 Warning Gong - A single beat sound used to warn of an unsafe flight condition or indication.

2.1.2.4 Warning "Cricket" - A device which generates a cricket-like sound to warn of speeds in excess of V_{MO} - M_{MO}.

2.1.2.5 Chimes - Used in conjunction with communication systems of the aircraft. For example: Cabin-to-flight deck; Selcall, etc.

2.1.3 Tactual Signals

2.1.3.1 Stick-Shaker - A device which causes the pilot's control wheel to vibrate to warn of approach to, or of operation in, a stalled condition.

2.1.3.2 Foot-Thumper - A device which vibrates the pilot's foot on the brake pedal to indicate the cycling of the anti-skid system, or to warn of wheel skidding.

2.2 Requirements:

2.2.1 Master Warning Light (s) - The master warning light (s), when required (see 2.1.1.1), will consist of one or two lights each of the dual bulb type.

2.2.1.1 Steady Master Warning Light - The steady master warning light shall be used exclusively to warn of fire and will be accompanied by the warning bell.

2.2.1.2 Flashing Master Warning Light - The flashing master warning light shall be used to indicate an unsafe condition other than fire.

2.2.1.3 Location - The master warning light, or lights, and the master caution light, will be located near the center line of the aircraft near the top of the center instrument panel.

2.2.2 Warning Lights

2.2.2.1 Warning Lights - An independent light system shall be provided for each individual function, or system to be monitored. Where a master warning light is required, it will supplement a specific steady warning light at the indicator or control of the area or equipment affected.

2.2.2.2 Warning lights shall be within the control device, or shall be located in close proximity to the indicator or control device, where attention to the indicator or control device is the prime function of the warning signal.

2.2.2.3 Warning lights shall be located with respect to the orientation of the area or equipment whose function they monitor and shall be consistent with Figure 5 of ARP 268.

2.2.2.4 The warning lights for the following specific indicators or control devices will be located in the indicator or control device, or on the control panel immediately adjacent thereto in such a manner as to positively identify the indicator or control requiring action.

a. Landing gear
b. Fire control
c. Feathering control (See ARP 268) - "ON" for power failure in all segments of flight.

2.2.3 Caution Lights

2.2.3.1 An independent steady light system shall be provided for each individual function or system to be monitored.

2.2.3.2 Caution lights shall be located with respect to the orientation of the area, or equipment, or systems whose function they monitor and shall be consistent with ARP 268.

2.2.3.3 Caution lights shall be located in close proximity to the indicator or control device where attention to the indicator or control device is the prime function of the signal.

2.2.4 Advisory Lights

2.2.4.1 An independent steady light system shall be provided for each individual function or system to be monitored.

2.2.4.2 Advisory lights shall be located with respect to the orientation of the area or equipment whose function they monitor and shall be consistent with ARP 268.

2.2.4.3 Advisory lights shall be located in close proximity to the indicator or control device where attention to the indicator is the prime function of the signal.

2.2.5 Signal Flags - Warning and Advisory - Signal flags may be used where specific indication is associated with an instrument or mechanical device. Where they are so used the flag signal will be an integral part of the instrument or device.

2.2.6 Audible Signals - Audible signals are required for all fire warning systems and other critical systems or devices where visual checks or warning may be insufficient to guarantee safety. They may also be used for other functions not bearing on safety but of sufficient importance to require their use.

2.2.7 Tactual Signals - Tactual signals may be employed to alert pilots' attention where visual check or normal sensations may be insufficient to guarantee safety. They may also be used for other functions not bearing on safety, but of sufficient importance to require their use.

2.3 Color Code - Lights

2.3.1 Warning Lights - Warning lights will be colored aviation red. The color is defined in Specification AN-C-56-2, Section D - General Requirements.

2.3.2 Caution Lights - Shall be amber, as defined in AN-C-56-2, Section D.

2.3.3 Advisory Lights - May be green, blue, or white, as defined in AN-C-56-2, Section D.

2.3.3.1 Green - Used to indicate a safe configuration or condition. When used in conjunction with a warning light the green light will indicate that action taken has resulted in complete system operation and the resulting configuration is safe.

2.3.3.2 Blue - Used to indicate that a system is on and operating normally, or that transitory action is taking place (with the exception of the landing gear warning system).

2.4 Intensity of Signal Lights (See AS 264, Section 5)

2.4.1 Signal light intensity to be used in either a bright or a dim system will meet the following values:

2.4.1.1 Master Warning Lights - The intensity of the master warning light will be 275 millilamberts for the bright intensity, and 140 millilamberts if dimming is used.

2.4.1.2 Warning Lights - Same as 2.4.1.1.

2.4.1.3 Master Caution Lights - Same as 2.4.1.1.

2.4.1.4 Caution Lights - The intensity of caution lights will be 275 millilamberts for the bright intensity and capable of dimming to not less than 25 millilamberts.

2.4.1.5 Advisory Lights - Same as 2.4.1.4.

2.4.2 Intensity Control - The dimming feature when used may be accomplished either electrically or mechanically. If a switch is used, the switch motion will comply with the requirements of ARP 268. The dimming feature shall not be capable of completely shutting off the light.

2.5 Reliability of Visual Signals

2.5.1 Master Warning Lights, Master Caution Lights & Annunciator Panels - Will be of the dual bulb type so that failure of a single bulb will not result in an inoperative condition of the signal.

If light covers with transilluminated nomenclature are used on an annunciator panel, it must be impossible to transpose these covers on to improper locations.

2.5.2 Warning Lights, Caution Lights & Advisory Lights - Signal lights, other than the master visual signals and annunciator panels, may be of the single bulb type. Where the single bulb type is used in connection with critical or essential indicators a provision for testing, such as the "push-to-test" type will be provided. The push-to-test circuit will be such that a short or failure of the bulb, bulb socket, or switch device will in no way create or cause a malfunction in the system in which such a light is used.

2.6 Operation of Visual Signal Systems

2.6.1 Master Warning Light(s) - Will illuminate when the condition to be warned of occurs. The master warning remains illuminated until its cap is pushed in, or until the condition is corrected, either of which extinguishes the master warning and resets it for other possible failures.

2.6.2 Warning Lights - Warning lights will illuminate when the condition to be warned of occurs. The warning lights will remain on as long as the condition exists or until the system is deactivated.

2.6.3 Master Caution Light - Will illuminate when the condition to be advised of occurs. The master caution signal remains illuminated until its cap is pushed in or until the condition is corrected, either of which extinguishes the master caution signal and resets it for other possible abnormalities.

2.6.4 Caution Lights - Will illuminate when the condition to be advised of occurs. The caution light will remain on as long as the condition exists or until the system is deactivated.

2.6.5 Advisory Lights - Will illuminate when the condition to be advised of occurs. The advisory light will remain on as long as the condition exists or until the system is deactivated.

2.7 Warning Flags or Indicators

2.7.1 Color Code - Where warning flags are used externally or independently from instrumentation, they should be of a bright yellow with black diagonals to provide contrast to the surrounding area.

Where warning flag indicators are used internally in instruments, the color should be yellow, or fluorescent red, with black wording thereon, if required. (Reference AS 269.)

2.7.2 Warning Flag or Indicators Independent From Instrument - Flags used in conjunction with mechanical devices independent of instrumentation will provide a clear, unmistakable warning that the condition to be warned of has occurred.

2.7.3 Instrument Warning Flags or Indicators - Flags used in conjunction with instruments will provide a clear, unmistakable warning that the condition to be warned of has occurred.

2.8 Audible Signal - Code

2.8.1 Bell - Indicates "FIRE", functions automatically and simultaneously with a fire warning light.

2.8.2 Horn - Indicates an unsafe aircraft configuration.
Specific applications

a. Landing gear unsafe with throttles retarded, or with wing flaps in the landing configuration. Steady sound.

Ø b. Unsafe takeoff configuration upon throttle opening Intermittent sound.

c. Cabin pressure above 10,000 feet. Intermittent sound.