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**AEROSPACE  
RECOMMENDED  
PRACTICE**

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HUMAN INTERFACE CRITERIA  
FOR COLLISION AVOIDANCE SYSTEMS  
IN TRANSPORT AIRCRAFT

1. PURPOSE AND SCOPE:

This document sets forth design and operational recommendations concerning the human factors issues and criteria for airborne collision and avoidance systems. The visual and aural characteristics are covered for the display of traffic information as well as the escape maneuver display on conventional and electronic flight decks. System utilization philosophy and flight deck integration considerations are also presented.

2. REFERENCES:

2.1 Applicable Documents:

- AS264 - Instrument and Cockpit Lighting for Commercial Transport Aircraft
- ARP268 - Location and Actuation of Flight Deck Controls for Transport Aircraft
- AS425 - Nomenclature and Abbreviations for Use on the Flight Deck
- ARP571 - Flight Deck Controls and Displays for Communication and Navigation Equipment for Transport Aircraft
- AS580 - Pilot Visibility from the Flight Deck Design Objectives for Commercial Transport Aircraft
- ARP1068 - Flight Deck Instrumentation, Display Criteria and Associated Controls for Transport Aircraft
- ARP1093 - Numeral, Letter and Symbol Dimensions for Aircraft Instrument Displays
- AS8034 - Minimum Performance Standard for Airborne Multipurpose Electronic Displays
- FAA-RD-81-38II - Aircraft Alerting System Standardization Study, Volume II Aircraft Alerting System Design Guidelines

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## 2.2 Proposed Applicable Documents:

- ARP1782 - Color and Light Intensity Measurements for Direct View CRT
- ARP4032 - Human Integration for Color Criteria and Standards
- ARP4102/4 - Flight Deck Alerting Systems
- ARP4102/10 - Collision Avoidance System

## 3. DEFINITIONS:

This section contains definitions of terms used in this document.

Advisory System - A system that supplies the crew with information and guidance that they can follow only if they have other reasons that reinforce such information and guidance.

Alert - Indicator (visual, auditory or tactile) which provides information to the crew in a timely manner about a non-normal situation.

Bearing - The angle, in the horizontal plane, between the longitudinal axis of the own aircraft and the relative location of an intruder aircraft measured in the clockwise direction when viewed from above.

CAS - Collision Avoidance System.

Caution Alert - Abnormal operational or aircraft system condition that requires immediate crew awareness and subsequent corrective or compensatory crew action.

Corrective Alert - Alert which requires a positive corrective action to resolve a conflict situation.

CPA - Closest point of approach of two aircraft in conflict.

Escape Maneuver - A computed maneuver to prevent a potential collision. It can be any single or combination of maneuvers which resolve a conflict.

Executive System - A system that supplies the crew with guidance that they are required to follow unless they have good reason to believe it should be ignored.

False Alert - An alert, caused by a false track or a system malfunction, that is given when no threat exists in the TCAS operational envelope.

Intruder - Any aircraft in the airspace of the own aircraft that is tracked by the collision avoidance system (including all threat aircraft).

Missed Alert - A system alert which is not given even though an aircraft is in the TCAS operational envelope and the threat of collision or potential collision exists.

Negative Alert - A corrective or preventive alert that requires the pilot not to do something to resolve a conflict (for example, "DON'T CLIMB").

3. DEFINITIONS: (Continued)

Nuisance Alert - An alert that is given when an aircraft is in the TCAS operational envelope and a maneuver by the TCAS aircraft is not necessary to achieve satisfactory aircraft separation.

Own Aircraft - The CAS-equipped reference aircraft.

Preventive Alert - An alert which provides the crew an escape maneuver (usually a vertical speed limit or a negative command) for which, because of their current flight path, they do not need to respond, for example, a "LIMIT CLIMB 500 fpm" alert when the aircraft is in level flight.

Resolution Advisory - Term used with the TCAS system for the display indication given to the crew recommending an escape maneuver to increase or maintain separation relative to an intruder aircraft.

TAU - A derived quantity, usually expressed in seconds, which represents the time to the point of closest approach between the own and intruder aircraft. It is defined as the range divided by the range rate.

TCAS - Traffic Alert and Collision Avoidance System

TCAS Invalid - A TCAS system alert that indicates that the Resolution Advisory, to which the crew is currently responding, is no longer a valid advisory.

TCAS Operational Envelope - The geometry of two or more aircraft (that is, altitude, speed, range, range rate, altitude rate, etc.) which is defined as a collision threat by the collision avoidance logic and causes an alert to be issued.

Threat Aircraft - An intruder that has been determined by the CAS threat detection logic to warrant either a caution or a warning alert.

Time Critical Warning - A warning condition in which the time to respond is extremely limited and the response to the alert is the most important action that the crew can take at that specific time (for example, ground proximity, windshear, collision avoidance).

Traffic Advisory - Term used with the TCAS system for the display indication that there is a traffic situation that could subsequently require a resolution advisory. The information contains no suggested maneuver.

Warning Alert - Emergency operational or aircraft system conditions that require immediate corrective or compensatory action by the crew.