

**DISPOSITION OF PUBLIC COMMENTS ON DRAFT POLICY STATEMENT ANM-03-111-18,
INSTALLATION OF TRANSPORT CATEGORY AIRPLANE FLIGHTDECK LIQUID CRYSTAL DISPLAYS**

Nr.	Commenter	Comment	Disposition
1	Cessna	Cessna concurs with the Policy Statement as drafted.	None required.
2	Northwest Airlines	NWA has no objections to the proposed policy statement as written.	None required.
3	Boeing	Boeing notes that while the title limits it to flightdeck application, the body of the policy statement does not incorporate this limitation, even though it should not apply to LCDs installed in the passenger cabin.	The FAA agrees that the policy statement should be explicit in applying only to flight deck displays. The policy statement has been revised to incorporate this suggestion.
4	Boeing	Boeing asserts that the policy should apply only to “new part numbers” and not to previously approved devices.	The FAA disagrees with this comment. The policy statement is intended to address installation of LCDs in transport category airplane flightdecks, and not approval of the displays themselves irrespective of the installation. Acceptable display characteristics for previously approved installations may not be acceptable in new, different installations. The policy statement is intended to identify display characteristics that will be found to be acceptable in any foreseeable installation.
5	Boeing	Boeing disagrees with the exclusion of paragraph 6b(4)(vi) of AC 25-11 from the policy statement because “the advice in this paragraph could apply to LCDs generically because "raster" field color luminance may be independently controlled from that of the map symbology (for weather and ground proximity information).	The guidance in the referenced paragraph was excluded from the draft policy because the distinction between raster and stroke display does not apply to LCDs. On further consideration, we have concluded that the LCD performance issues that this paragraph was intended to address encompass separate adjustment of the brightness of uniformly filled display areas relative to overlaid text or symbology, and not simply raster vs. stroke considerations. This is consistent with previous applications of this recommendation. Accordingly, the final policy includes a provision to replace paragraph 6b(4)(vi) of AC 25-11 with an equivalent one having revised terminology.

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6	Boeing	<p>Boeing states that many of the recommendations in SAE ARP 4256A “are quality or aesthetic in nature and are not safety of flight requirements” and that some of these recommendations are not appropriate as a “certification basis for LCD units.” Boeing identifies the specific recommendations in the following paragraphs of ARP 4256A that they consider to be excessively stringent for use as “certification criteria”:</p> <ul style="list-style-type: none"> 4.1.10 Response Time 4.2.2.3 Design Eye Position Luminance Uniformity 4.2.2.5 Background (Black) Uniformity 4.2.2.6 Background (Black) Chroma 4.2.3 Color <ul style="list-style-type: none"> 4.2.4.1 Chroma Uniformity 4.2.4.2 Design Eye Position Chroma Tolerance 4.2.4.3 Viewing Envelope(s) Chroma Tolerance 4.3.2 Lag Time 	<p>The FAA disagrees with this general comment and the detailed comments that follow from it. 14 CFR 25 defines requirements that must be met to obtain design approval of transport category airplanes. The policy statement, on the other hand, identifies one means, but not the only means, of complying with the associated regulatory requirements, as stated in the “Effect of Policy” section. It does not define new requirements, nor does it reduce or otherwise change requirements.</p> <p>The criteria recommended in SAE ARP 4256A represent industry consensus on LCD performance levels that will, in foreseeable installations, result in acceptable operating characteristics in the flightdecks of transport category airplanes. The FAA has adopted these recommendations as acceptable means of compliance to the regulatory requirements identified in the policy’s Regulatory Reference list. These acceptable means of compliance are not intended to be “certification criteria” or minimum performance standards.</p> <p>Meeting the quantitative criteria in ARP 4256A provides a means of showing compliance that does not entail identification (and justification) of limiting conditions, and does not require allocating simulation or flight test resources to showing compliance with respect to the effects of particular design parameters. If a proposed installation does not meet the criteria referenced in the policy, the FAA can approve the design based on data provided by the applicant, which provide an acceptable rationale and/or demonstrate that the design is compliant irrespective of deviations from the criteria in ARP 4256A.</p>

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7	Boeing	Boeing advises that SAE's A4 Committee is revising Aerospace Standard (AS) 8034, Minimum Performance Standard for Airborne Multipurpose Electronic Displays to incorporate much of the technical content of ARP 4256A.	SAE has published a revision to AS8034, dated July 2005. The FAA has reviewed the minimum performance standards in AS8034 and has determined that they would be sufficient to show compliance in some, but not all installations. The acceptable means of compliance in this policy statement, on the other hand, are intended to identify a level of performance that would be found acceptable in any foreseeable installation. Accordingly, we still believe the criteria in ARP4256A to be more appropriate general guidance for acceptable means of compliance than the minimum performance standards in AS8034A. Where criteria in AS8034A are lower than those in ARP4256A, the FAA may request additional substantiation of the acceptability of the proposed installation with respect to each parameter in question.
8	Boeing	Boeing states that the recommendations in paragraph 3.4 of SAE ARP 4256A for malfunction indication are not necessarily appropriate as certification criteria because the fonts and symbols used on LCDs are tolerant of single element and line failures (except for some seven-segment numeric displays).	The FAA disagrees with this comment because there is no specific requirement for LCDs to use symbols and fonts that are tolerant of single element and line failures. Proposed designs that do not use fonts and symbols that are tolerant to these faults can be found to be acceptable by meeting these criteria in ARP 4256A. Conversely, showing that the fonts and symbols are tolerant to the loss of a single column, line or element has been found to be an acceptable alternative to providing a malfunction indication. As with any other equipment, LCD failures and malfunctions should be addressed in the system safety analyses per AC 25.1309-1A. The policy statement has been revised to clarify this issue.

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9	Boeing	Boeing comments that the display attributes for warm-up and power transient recovery identified in SAE ARP 4256A (paragraphs 4.3.1 and 4.3.1.1 respectively) are “not applicable” because they only relate to aesthetics or quality and have no bearing on the level of safety that the display will support.	<p>The FAA disagrees with this comment. AC 25-11 includes guidance applicable to CRT displays for both of these characteristics, in paragraph 8a of the AC itself for power transients and in paragraph 5.3.1 of ARP 1874, as referenced in the AC, for warm-up. The recommendations for LCDs in ARP 4256A provide criteria that are acceptable means of compliance to the criteria comparable to the ones that have been used for CRT displays.</p> <p>Both of these display attributes are included in the acceptable means of compliance for LCDs, as they are for CRT displays, because unacceptable levels of performance for warm-up and transient recovery can compromise the ability of a display to perform its intended function as required by § 25.1301(a).</p> <p>While the 10 minute warm-up recommendation in ARP 4256A may be more stringent than what some LCD installations may require for compliance with the regulatory requirements, this represents an industry consensus of a level of performance that will be generally acceptable. The FAA has no basis at this time for a reduced generally acceptable level of performance. As is the case for all of the guidance in this policy, the applicant may propose alternative means of compliance. Applicants who seek approval of displays that do not meet the criteria in this policy should provide data showing that the display performance complies with the regulatory requirements.</p>
10	Boeing	Boeing notes that proposed designs that met the quantitative criterion for specular reflections identified in paragraph 4.2.6 of ARP 4256A were found in pilot evaluations not to be acceptable. Accordingly this metric should not be used as a “certification criterion” as it is not a reliable predictor of the acceptability of an LCD installation.	While the policy statement is not intended to present “certification criteria” that constitute minimum acceptable levels of performance, the FAA agrees that it is inappropriate to use a performance metric that does not reliably predict acceptable performance. The policy statement should not include this metric as an acceptable means of compliance with respect to specular reflections and has been revised to replace it with an acceptable means of compliance using flight crewmember evaluation in selected conditions.