Federal Aviation Administration

Memorandum

Date: June 17, 2016

To: Manager, Wichita ACO, ACE-115W

From: Manager, Transport Airplane Directorate, ANM-100

Prepared by: Jeffrey Englert, ACE-116W

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Powerplant Instrumentation for RCI LDS-2100 Installation on Boeing 767-200 and 767-300F Series Aircraft Equipped with General Electric or Pratt & Whitney Engines, FAA Project # SA06180WI-T

ELOS Memo # SA06180WI-T-P-1

Regulatory Ref: 14 CFR 25.1549(b) and (c)

This memorandum informs the certificate management aircraft certification office of an evaluation made by the Transport Airplane Directorate (TAD) on the establishment of an equivalent level of safety (ELOS) finding for the Rockwell Collins Incorporated (RCI) amended supplemental type certificate (STC) that installs the Large Display System (LDS-2100) in Boeing Model 767-200 and -300F series aircraft equipped with General Electric or Pratt & Whitney (P&W) engines.

Background

Title 14, Code of Federal Regulations (14 CFR) 25.1549(b) requires each powerplant and auxiliary power unit instrument, as appropriate to the type of instrument, to have the normal operating range marked with a green arc or green line, not extending beyond the maximum and minimum safe limits. Section 25.1549(c) requires "Each takeoff and precautionary range must be marked with a yellow arc or a yellow line."

The primary engine displays on turbine engine powered transport aircraft have traditionally displayed the required engine rotor speeds, oil temperature, oil pressure and fuel flow required by § 25.1305 in an analog-only or an analog and digital format. Advisory Circular (AC) 20-88A, paragraph 4(c), also states that "digital indicators are most valuable when integrated with an analog display." Furthermore, the addition of the P&W engines creates the need for engine pressure ratio (EPR), an additional powerplant instrument, required by §25.1305(d)(1).

The RCI LDS-2100 design for the display of powerplant instruments does not have a green arc or green line marking for the normal operating range and uses an amber color in place of yellow. Therefore, the LDS-2100 does not directly comply with § 25.1549(b) or (c).

Applicable regulation(s)

14 CFR 21.21(b)(1), 25.1549(b) and (c)

Regulation(s) requiring an ELOS finding

14 CFR 25.1549(b) and (c)

Description of compensating design features or alternative standards which allow the granting of the ELOS finding (including design changes, limitations or equipment need for equivalency)

The RCI LDS-2100 design includes instrument pairs (left and right engines) provided in the form of round gauges; including: EPR, gas generator speed (N1), exhaust gas temperature (EGT), engine core speed (N2), and fuel flow (FF), as applicable to the particular engine model installed. Each instrument has a white arc accompanied by precautionary (amber) and limit (red) radials as applicable. Additionally, each instrument uses a radial pointer and digital numeric readout to provide trending data, sensory cues and precise operating values to the crew.

The remaining engine indications are in the form of a single vertical tape gauge; including: oil pressure, oil temperature, oil quantity and engine imbalance (vib). Each instrument has a white vertical scale accompanied by precautionary (amber) range markings and limit (red) lines as applicable. Additionally, each instrument uses a pair of pointers (left and right engines) and digital numeric readout to provide trending data, sensory cues and precise operating values respectively to the crew.

For both types of instrument presentations, the pointers and digital numeric readouts are white while in the normal operating range; amber while in the precautionary operating range; and red while outside of safe operating limits.

The RCI LDS-2100 design uses the same display logic and similar visual format as the system it is replacing, which has satisfactory service experience. Additionally, the use of white and amber is consistent with the rest of the Model 767-200 and 767-300F flightdeck color use philosophy.

The compensating features are the same for both the General Electric or P&W engines.

Explanation of how design features or alternative standards provide an ELOS to that intended by the regulation

Although noncompliant with § 25.1549(b) and (c), the markings on the analog presentations show the operating limits; the color changes when the digital values go from normal (white) to

cautionary (amber) and beyond to exceed the operating limits (red); and the use of white and amber is consistent with the rest of the flightdeck and original Model 767-200 and 767-300F powerplant indications provide an ELOS as that established by providing analog displays with green and yellow markings.

FAA approval and documentation of the ELOS finding

The FAA has approved the aforementioned ELOS finding in project Issue Paper P-1, titled Powerplant Instrumentation for RCI LDS-2100 Installation on Boeing 767-200 and 767-300F Series Aircraft Equipped with General Electric or Pratt & Whitney Engines. This memorandum provides standardized documentation of the ELOS finding that is non-proprietary and can be made available to the public. The TAD has assigned a unique ELOS memorandum number (see front page) to facilitate archiving and retrieval of this ELOS finding. This ELOS memorandum number should be listed in the Limitations and Conditions section of the STC in accordance with the statement below:

Equivalent Level of Safety Findings have been made for the following regulation(s):

§ 25.1549(b) and (c) - Powerplant and Auxiliary Power Unit Instruments

(documented in TAD ELOS Memo SA06180WI-T-P-1)

Originally Signed by Robert Hettman *June 17, 2016*

Transport Airplane Directorate, Date
Aircraft Certification Service

ELOS Originated by:	ACO Manager:	Routing Symbol:
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