

Qualification Test Report

QTR-00012

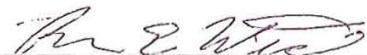
For

**VIVISUN LOGIC Series (Electronic Latching and Pulse /
Timer options) and LED Switch With and Without Discrete
Dimming**

**In accordance with
RTCA DO-160F**

By
Aerospace Optics, Inc.
May 10, 2011

Aerospace Optics, Inc. Quality Control Approval:



Brian Wish, Vice President, Quality

Aerospace Optics, Inc. Company Representative Approval:



Loren K. Jensen, President and COO

PROPRIETARY RIGHTS NOTICE

This document contains proprietary information and designs owned by Aerospace Optics, Inc. Neither this document nor any part of this document may be disclosed or reproduced in whole or in part without the written permission of Aerospace Optics Inc.

TABLE OF CONTENTS

Table of Contents	2
Test Result - Overall	4
Test Program Summary	4
Description of Parts to be Tested	5
Compliance Matrix	6
Appendix A – Test Article Drawings	8
Exhibit A - LED-DJ-11-HE-E0DA9	9
Exhibit B - LED-54-41-ED-SAAAY	19
Exhibit C - LR3-DM-11-ED-81168	29
Exhibit D - LED-13-11-ED-30508	45
Exhibit E - LR3-44-24-ED-81100	55
Exhibit F - LED-44-24-EU-30508	65
Appendix B – Conformity Documentation	75
Exhibit A – Delegation Letter	76
Exhibit B – FAA Form 8110-3	77
Exhibit C – FAA Form 8120-10	80
Exhibit D – FAA Form 8100-1, FAA Form 8130-9, FAA Form 8130-3 (Test Articles)	90
Exhibit E - FAA Form 8100-1, FAA Form 8130-9 (Test Setups)	105
Exhibit F - FAA Form – Request For Special Delegation	151
Appendix C – Test Reports	152
Exhibit 1 - Ground Survival and Operating Low Temperature	153
Exhibit 2 - Ground Survival and Operating High Temperature	168
Exhibit 3 - Altitude and Overpressure	183
Exhibit 4 - Temperature Variation	201
Exhibit 5 - Humidity	217
Exhibit 6 - Operational Shock and Crash Safety	231
Exhibit 7 - Crash Safety (Continuous)	288
Exhibit 8 - Vibration	310
Exhibit 9 - Waterproofness	527
Exhibit 10 - Salt Fog	539
Exhibit 11 - Magnetic Effect	552
Exhibit 12 - Power Input Voltage	556
Exhibit 13 - Voltage Spike	647

Exhibit 14 - Audio Frequency Conducted Susceptibility	668
Exhibit 15 - Induced Signal Susceptibility	707
Exhibit 16 - Radio Frequency Susceptibility	738
Exhibit 17 - Radio Frequency Emissions	932
Exhibit 18 - Lightning Induced Transient Susceptibility	946
Exhibit 19 - Electrostatic Discharge	1139
Exhibit 20 - EMC Interference and Susceptibility	1144

Test Result - Overall

The test articles and test set-ups for the testing were all properly conformed. The test procedure was approved by Hawker-Beechcraft per QTP-00012. **The results obtained using these articles, set-ups, and procedures do not give cause for rejection per QTP-00012.**

Test Program Summary

Six switches (See detail below) were tested per RTCA DO-160 Rev F. Specific test parameters were designed to meet Hawker Beechcraft Corporation (HBC) preferred requirements. The test program was documented in QTP-00012, No Revision. QTP-00012 Rev A contains all 'redline' changes approved during testing, as well as administrative changes to test report formats, Testing began 21 Feb 2011 and concluded on 14 Apr 2011. All testing was conducted at Aerospace Optics, Inc. facilities with the following exceptions.

The Crash Safety (Continuous) test from RTCA DO-160 Rev F, Section 7, was conducted at National Technical Systems (NTS), Plano, TX. This test was performed at the load factors detailed in QTP-00012.

The Radiated Emissions test from RTCA DO-160 Rev F, Section 21 and a portion of the Radiated Susceptibility test from RTCA DO-160 Rev F, Section 20, were also conducted at NTS, Plano, TX. Their report is included as a portion of the Aerospace Optics, Inc. Qualification Test Report, QTR-00012.

For all tests described herein, recorded data was taken from instruments calibrated in accordance with ISO-12000 or ANSI/NCSL Z540-1. Calibration dates were to be recorded and instruments were within current calibration interval.

Description of Test Articles

Aerospace Optics, Inc., produces illuminated push-button switches and indicators for the military and commercial aviation markets. The samples below have various body styles and options, and represent some of the most commonly ordered customer options.

Item	Test Article P/N	Test Article Description
A	LED-DJ-11-HE-E0DA9	LED illuminated electromechanical pushbutton switch for Electronic Latching applications. Logic series 1. Two pole, single break, gold contacts. Unsealed. Single circuit, one common, momentary actuation. Full screen, +28VDC common anode, one input with all four quadrants connected.
B	LED-54-41-ED-SAAAY	LED illuminated electromechanical pushbutton switch for Discrete Dimming application. Two pole CTS body w/ 18-650 plug. Two pole, double break, silver contacts. Unsealed with EMI shield. Single circuit, one common, momentary actuation. 3-way bottom split screen. +28VDC common anode, three inputs, only top two quadrants coupled.
C	LR3-DM-11-ED-81168	LED illuminated electromechanical pushbutton switch for Pulse/Timer applications. Compact multi-function body (MFB) with Pulse/Timer circuit. Unsealed. Single circuit, one common, momentary actuation. +28V DC/AC , three inputs, only top two quadrants coupled.
D	LED-13-11-ED-30508	LED illuminated electromechanical pushbutton switch. Turret solder terminals. Single pole, double break, silver contacts. Unsealed. Single circuit, one common, momentary actuation. 3-way bottom split screen. +28VDC common anode, three inputs, only top two quadrants coupled.
E	LR3-44-24-ED-81100	LED illuminated electromechanical pushbutton switch. Leaded LEDs. Two pole CTS body. Two pole, double break, silver contacts. Drip proof. Single circuit, one common, alternate actuation. 3-way bottom split screen. +28V DC/AC, three inputs, only top two quadrants coupled.
F	LED-44-24-EU-30508	LED illuminated electromechanical pushbutton switch. Two pole CTS body. Two pole, double break, silver contacts. Drip proof. Single circuit, one common, alternate actuation. 3-way bottom split screen. +5VDC common anode, three inputs, only top two quadrants coupled.

Compliance Matrix

Qualification Requirement	Test Requirement	Applicable Test Procedures Document	Applicable Test Reports Document	Test Passed?
Ground Survival Low Temp and Operating Low Temp	DO-160F 4.5.1, Category F2, Category B2 (sealed units)	QTP-00012 (STP-1604.1)	QTR-00012 (STR-1604.1)	Y
Ground Survival High Temp Operating High Temp	DO-160F 4.5.3, Category F2	QTP-00012 (STP-1604.2)	QTR-00012 (STR-1604.2)	Y
Altitude and Overpressure	DO-160F 4.6.1, Category F2	QTP-00012 (STP-1604.3)	QTR-00012 (STR-1604.3)	Y
Temperature Variation	DO-160F 5, Category C	QTP-00012 (STP-1605)	QTR-00012 (STR-1605)	Y (1)
Humidity	DO-160F 6, Category B	QTP-00012 (STP-1606)	QTR-00012 (STR-1606)	Y
Operational Shock / Crash Safety (Pulse)	DO-160F 7.2, Category B	QTP-00012 (STP-1607.1)	QTR-00012 (STR-1607.1)	Y
Crash Safety (Continuous)	DO-160F 7.3, Category B	QTP-00012 (STP-1607.2)	QTR-00012 (STR-1607.2)	Y
Vibration	DO-160F 8, Category R, Category U	QTP-00012 (STP-1608)	QTR-00012 (STR-1608)	Y
Waterproofness	DO-160F 10, Category Y (un-sealed), Category R (sealed)	QTP-00012 (STP-1610)	QTR-00012 (STR-1610)	Y
Salt Fog	DO-160F 14, Category T	QTP-00012 (STP-1614)	QTR-00012 (STR-1614)	Y
Magnetic Effect	DO-160F 15, Category Z	QTP-00012 (STP-1615)	QTR-00012 (STR-1615)	Y
Power Input Voltage	DO-160F 16 Category A	QTP-00012 (STP-1616)	QTR-00012 (STR-1616)	Y
Voltage Spike	DO-160F 17, Category A (28 V), Category B (5 V)	QTP-00012 (STP-1617)	QTR-00012 (STR-1617)	Y
Audio Frequency Conducted Susceptibility	DO-160F 18, Category Z	QTP-00012 (STP-1618)	QTR-00012 (STR-1618)	Y
Induced Signal Susceptibility	DO-160F 19, Category CW	QTP-00012 (STP-1619)	QTR-00012 (STR-1619)	Y
Radio Frequency Susceptibility (Radiated)	DO-160F 20, Category Y	QTP-00012 (STP-1690)	QTR-00012 Report by NTS	Y
Radio Frequency Susceptibility (Conducted)	DO-160F 20, Category Y	QTP-00012 (STP-1620)	QTR-00012 (STR-1620)	Y
Emission of Radio Frequency Energy (Conducted)	DO-160F 21, Category P	QTP-00012 (STP-1621)	QTR-00012 (STR-1621)	Y

Qualification Requirement	Test Requirement	Applicable Test Procedures Document	Applicable Test Reports Document	Test Passed?
Emission of Radio Frequency Energy (Radiated)	DO-160F 21, Category P	QTP-00012 (STP-1690)	QTR-00012 Report by NTS	Y
Lightning Induced Transient Susceptibility	DO-160F 22, Category B3K33	QTP-00012 (STP-1622)	QTR-00012 (STR-1622)	Y
Electrostatic Discharge	DO-160F 25	QTP-00012 (STP-1625)	QTR-00012 (STR-1625)	Y

Notes:

(1) Test requirement was for a rate of temperature change of $> 2^{\circ}$ C per minute to meet Category C requirement or RTCA DO-160F, Section 5. Test was conducted at $> 5^{\circ}$ C per minute, exceeding the Category C requirement and meeting the more stringent Category B requirement.

In Reply, Refer to: 940-2011-02350

May 18, 2011

FAA Project No: TD5229WI-T
Cert. Project No: 47738-A

Action

Info Only

2011-1493
JUL 06 2011

Federal Aviation Administration
Mr. Erik Brown, Program Manager
Wichita Aircraft Certification Office
1801 Airport Road, Room 100
Wichita, KS 67209

Subject: Hawker Model 4000 – Qualification Test Report (QTR) for VIVISUN LOGIC Series (Electronic Latching and Pulse / Timer options) and LED Switch With and Without Discrete Dimming

Dear Mr. Brown:

Hawker Beechcraft Corporation (HBC) is submitting QTR-00012: Qualification Test Report (QTR) for VIVISUN LOGIC Series (Electronic Latching and Pulse / Timer options) and LED Switch With and Without Discrete Dimming. Due to the size of this report it is being provided in CD format in lieu of a paper copy. The following data is associated with Certification Plan 4000E360497, Model 4000 Block Point Upgrade A – HI Load 20 Avionics Options/Upgrades.

Document(s):

QTR-00012, Rev N/R (HBC Rev1): VIVISUN LOGIC Series (Electronic Latching and Pulse / Timer options) and LED Switch With and Without Discrete Dimming

(2) FAA Form(s) 8110-3

DER(s):

John L. Wiginton, DERT-230135-CE,; Systems & Equipment (EE)
Howard S. Jordan Jr., DERY-230552-CE; HIRF/Lightning

Approved

Recommended

X

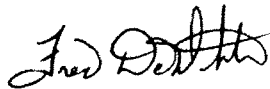
X


Contact:

John Dicken 676-0077

Sincerely,

HAWKER BEECHCRAFT CORPORATION



 / Randolph Shields, Director of Safety and Certification

RS: sss

Enclosures (CD)

THE FAA WICHITA AIRCRAFT CERTIFICATION OFFICE,

ACE-115W, ACKNOWLEDGES RECEIPT AND

ACCEPTS THE APPROVAL

CONCURS WITH THE RECOMMENDATION

ACCEPTS THE CERTIFICATION PLAN

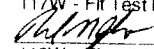
FOR COMMENTS SEE FAA LETTER DATED _____

THIS DATA HAS BEEN ADDED TO OUR FILE

116W - Mechanical DATE 116W - Propulsion DATE

117W - Fit Analyst DATE 117W - Fit Test Pilot DATE

118W - Airframe DATE 119W - Elect / Avionics DATE

 6/30/11