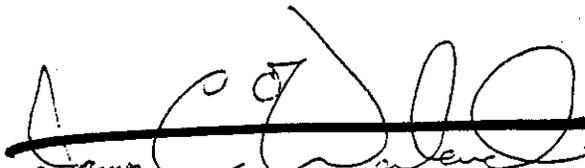


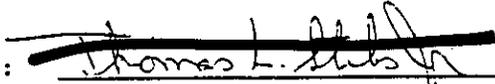
May 7, 1992

QUALIFICATION TEST REPORT
CUSTOM CONTROL PRESSURE SWITCH
MODEL 7G1018
(Boeing 60B92400-7)

Tested By:

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Quality Assurance
Lab Technician

Prepared By:

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Quality Assurance Engineer

Approved By:

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Quality Assurance Manager

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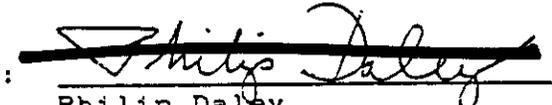
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Philip Daley
Chief Engineer

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5.9.24 EXPLOSION PROOF (60B92400, Para. 4.2.1.4.8)

TEST PROGRAM: The test unit was prepared for explosion proof testing by drilling and tapping openings in the case for an outlet hose connection for the fuel vapor air mixture circulation system and for mounting a spark gap device as shown in figure 4. The case volume was not altered by more than +/-5% by any modification to facilitate the introduction of explosive vapor.

When inserting the hose from the blower, adequate precaution was taken to prevent ignition of the ambient mixture by backfire or the release of pressure through the supply hose. A spark gap device was used for igniting the explosive mixture within the case. The test unit was installed in the explosion chamber.

The test was performed at an altitude between sea level and 5,000 ft. as follows:

Step 1 - The chamber was sealed and the internal pressure reduced sufficiently to simulate an altitude between ground level and 5,000 ft. The ambient chamber temperature was at least 25°C (77°F). An explosive mixture within the chamber was obtained.

Step 2 - The internal case ignition source was energized in order to cause an explosion within the case. The occurrence of an explosion within the case was detected by a reliable method.

Step 3 - At least five internal case explosions were accomplished at the test altitude selected. If the case tested is small (not in excess of one-fiftieth of the test chamber volume) and if the reaction within the case upon ignition is of an explosive nature without continued burning of the mixture as it circulates into the case, more than one internal case explosion, but not more than five, may be produced without recharging the entire chamber. Ample time was allowed between internal case explosions for replacement of burnt gases with fresh explosive mixture within the case.

SUCCESS CRITERIA: The internal case explosions produced shall not cause a main chamber explosion. The explosiveness of the fuel-air mixture in the main chamber shall be verified. If the air-vapor mixture in the main chamber is not found to be explosive, the test shall be considered void and the entire procedure repeated.

Information to be recorded: As required by MIL-STD-810D, Procedure II, Paragraph II-4.

TEST RESULTS: The internal case explosions produced did not cause a main chamber explosion. See Appendix I for Environment Associates Test Report.

APPENDIX I

ENVIRONMENT ASSOCIATES
EXPLOSION TEST REPORT

27 NOVEMBER 1991

TEST REPORT NO. 10612-117104

EXPLOSIVE ATMOSPHERE TEST REPORT

FOR THE

PRESSURE SWITCH

PART NUMBER 7G1018

MANUFACTURED BY

CUSTOM CONTROL SENSORS, INC.
21111 PLUMMER STREET
CHATSWORTH, CALIFORNIA 91311

PREPARED BY

ENVIRONMENT ASSOCIATES, INC.
9604 VARIEL AVENUE
CHATSWORTH, CALIFORNIA 91311

27 NOVEMBER 1991

TEST REPORT NO. 10612-117104

A P P R O V A L S H E E T

Environment Associates, Inc. hereby certifies that the information presented in this report, to the best of our knowledge, is true and correct in all respects.



ENVIRONMENT ASSOCIATES, INC.
Robert Coiteux, Laboratory Manager

27 NOVEMBER 1991

TEST REPORT NO. 10612-117104

R E V I S I O N S H E E T

REVISION LETTER

DESCRIPTION OF REVISION

DATE

APPROVAL

27 NOVEMBER 1991

TEST REPORT NO. 10612-117104

A D M I N I S T R A T I V E D A T A

PURPOSE OF TEST: To demonstrate compliance to the applicable requirements of the specifications cited below.

ITEM SUBJECTED TO TEST: Pressure Switch, Part Number 7G1018

TEST SPECIFICATIONS: QTP 7G1018, Paragraph 5.9.23. Qualification Test Procedure (Explosion Proof)

SUBMITTED BY: Custom Control Sensors, Inc.
 21111 Plummer Street
 Chatsworth, California 91311

TESTING AGENCY: Environment Associates, Inc.
 9604 Variel Avenue
 Chatsworth, California 91311

EXPLOSION PROOF: Consolidated Laboratories, Inc.
 Covina, California 91722

DATES TESTING CONDUCTED: November 20 through November 21, 1991

AUTHORIZATION TO TEST: Custom Control Sensors, Inc. Purchase Order No. F7104

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27 NOVEMBER 1991

TEST REPORT NO. 10612-117104

S U M M A R Y O F T E S T R E S U L T S

<u>TEST</u>	<u>SERIAL NO.</u>	<u>PASS/FAIL</u>
1.0 Explosion Proof	N/A	X

Note:

"Pass" in the column above indicates completion of the test. All operation of the test item was by Custom Control Sensors, Inc. personnel.

GENERAL INFORMATION

1.0 GENERAL

1.1 TEST ITEM DESCRIPTION

Pressure Switch, Part Number 7G1018

1.2 REFERENCE DOCUMENTS

Military

MIL-STD-810D Environmental Test Methods and Engineering Guidelines Method 511.2, Procedure II, Explosive Atmosphere

MIL-STD-831 Preparation of Test Reports

Custom Control Sensors, Inc.

QTP 7G1018 Qualification Test Procedure Paragraph 5.9.23, Explosion Proof

1.3 TOLERANCES

Test Equipment

Test equipment utilized was calibrated to MIL-STD-45662, latest edition, and traceable to the National Institute for Standards and Technology.

Unless otherwise described in this report, the environmental test equipment was capable of controlling the test equipment within the following tolerances:

Temperature at the Control Sensor: +/- 2.0 degrees C: Sensor response time < 20 seconds

Pressure: +/- 5% or +/- 1.5 mmHg, whichever is less (manometers); +/- 10 % to 10-5 torr (ion gages)

Relative Humidity at the Control Sensor: +/- 5 %

Vibration Amplitude: Sinusoidal: +/- 10 %

Vibration Frequency: +/- 1% or +/- 1/2 Hz below 25 Hz

Acceleration: +/- 10 %

Time: +/- 5 % or +/- 30 minutes, whichever is less

27 NOVEMBER 1991

TEST REPORT NO. 10612-117104

TOLERANCES (continued)

Laboratory Ambient Conditions

All laboratory ambient conditions were maintained as follows:

Temperature: 73 +/- 18 degrees F

Pressure: 725 + 50, -75 mmHg

Relative Humidity: 50 +/- 30 %

1.0 EXPLOSION PROOF

1.1 REFERENCE

QTP 7G1018, Paragraph 5.9.23 and MIL-STD-810D, Method 511.2
Procedure II

1.2 PROCEDURE

1.2.1

The test sample, part number 7G1018, was installed in the explosive atmosphere chamber. The sample case had been drilled and a spark gap installed to permit ignition of the fuel mixture in the sample cavity during the test. The sample was installed in the chamber and a thermocouple was affixed to the sample to monitor sample temperature. The sample was connected to a vacuum pump through a line fitted with an explosion indicator as described in the test report issued by Consolidated Laboratories, Inc.

1.2.2

The chamber temperature was raised to 110 degrees F and stabilized.

1.2.3

The chamber pressure was reduced to simulate an altitude of 1500 meters (5,000 feet) above site altitude. 57.9 ml of n-hexane was injected into the chamber evaporation dish. Three to four minutes was allowed for evaporation and circulation of the fuel. Air was admitted into the chamber until the pressure indicated site altitude.

1.2.4

The mixture was drawn into the sample cavity and ignited. This was repeated five (5) times. One drop of n-hexane was placed in the switch cavity prior to the series of five internally generated explosions to increase the effectiveness of the internal explosions.

1.2.5

When no explosion occurred in the main chamber, a quantity of the fuel-air mixture was drawn into the chamber sampling bottle and ignited to verify that an explosive mixture was present in the test chamber.

1.2.6

The test sample was removed from the test chamber and returned to Custom Control Sensors, Inc. for further evaluation.

1.3 RESULTS

1.3.1

The Explosion Proof test was performed at the facility of Consolidated Laboratories, Inc. Covina, California during the period from November 20 through November 21, 1991.

1.3.2

The sample was returned to Custom Control Sensors, Inc. personnel for evaluation.

1.3.3

Test Report Number 4252 issued by Consolidated Laboratories, Inc. may be found in Appendix I. This report contains a detailed description of the test conduct, a list of test equipment used and a photograph of the test setup.

27 NOVEMBER 1991

TEST REPORT NO. 10612-117104

APPENDIX I

TEST REPORT NUMBER 4252

ISSUED BY

CONSOLIDATED LABORATORIES, INC.
COVINA, CALIFORNIA 91722



Consolidated Laboratories, Inc.

732 ArrowGrand Circle
Covina, California 91722
(818) 915-8991

REPORT NO. 4252

PAGE 1 of 3

LAB DATA SHEET

CCS
 Part No. 7G1018 S/N - - Sample 1 Job 4252
 Description Pressure Switch Co. Env. Assoc.
 Page 1.0

TEST:	EXPLOSION PROOF	Start	To Cpt.	Cptd.
To Spec.:	CCS QTP 7G1018, Para. 5.9.24; MIL-STD-810D, Method 511.2, Proc. II	Date <u>11/20/91</u>		<u>11/21/91</u>
		Test By <u>[Signature]</u> CLI 2		<u>[Signature]</u> CLI 2
		Photo <input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>

Photo Req'd Yes - Unit in chamber

CLI
2
INSP

- The unit has been furnished for test with a 1/4" tube fitting installed in the upper section of the switch body to allow access to the cavity between the terminal side of the internal microswitch and the inlet ports of the assembly. The same cavity above the microswitch is fitted with a miniature spark plug to allow deliberate ignition of the explosive charge contained in the cavity.
- Install the unit in the test chamber and attach a thermocouple junction to the body of the assembly at a point of concentration of mass to allow determination of temperature stabilization. Connect the side port of the unit to a bulkhead pass-through fitting in the test chamber wall which is connected to an external vacuum pump. Tee a small closed end "J" tube glass manometer into the line. The manometer contains a small slug of red instrument oil in the bottom of the "J". When a deliberately generated explosion occurs within the unit, the pressure increase caused by the explosion causes movement of the slug of oil in the bottom of the "J". With a tee in the internal connecting line, connect to the chamber sampling bottle and install a shutoff valve in that line. The sampling bottle is fitted with a miniature spark plug to allow ignition of the contents of the bottle.
- Seal the chamber, heat it to 110°F and maintain the temperature for the duration of the test. Allow the unit and chamber walls to come to within 11°C (20°F) of 110°F before starting the test. Evacuate the chamber to 1500 meters, nominally 5000 ft., above station altitude. Inject 57.9 ml of n-hexane into the chamber evaporation dish and allow 3, +1, -0 minutes for evaporation and circulation of the fuel. Then, bleed air into the chamber to return it to station altitude. With the chamber maintained at temperature and station altitude, draw a charge of the chamber explosive mixture into the internal cavities of the unit using the externally connected vacuum pump and close off the vacuum line. Using the spark plug of the unit, ignite the mixture in the unit and verify ignition by observing the oil slug in "J" tube manometer described above. Repeat the cavity charging/firing cycle for a total of 5 internal explosions. After completion of the fifth cycle, draw a charge into the chamber sampling bottle and additionally confirm the explosiveness of the main chamber atmosphere by firing the charge with the spark plug in the chamber sampling bottle and observing the explosive flash in the bottle. After completion of the entire sequence, thoroughly purge the chamber.

5 internal explosions obtained successfully? YES CLI
2
INSP

Was ignition attained in the sample bottle at the end of the run? YES CLI
2
INSP

Report Note: One drop of n-hexane was placed in the switch cavity prior to the series of five internally generated explosions to increase the effectiveness of the internal explosions.



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Covina, California 91722
(818) 915-8991

TEST REPORT

REPORT NO. 4252

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TEST EQUIPMENT LIST

Items maintained within current applicable calibration period.

-Explosion Chamber: Consolidated Model 1; ID/N 3006. Chamber equipped with fuel injection and circulation system, thermally controlled heaters, altitude generating equipment, atmosphere sampling device and other supporting equipment to test in accordance with the requirements of MIL-STD-810D, Method 511.2, Proc. II. Used with the following items of support equipment:

--Absolute Pressure Manometer: Meriam Model A-538, ID/N 404, 35" well type, -1000 to 80,000' altitude. Calib. due 11-21-91, 12 mos.

--Temperature Indicator/Controller: Watlow Series 808, Model 808A-0612-0000, ID/N 933, -99 to +600°F with XXX°F digital readout, $\pm 2^\circ\text{F}$. Calib. due 3-1-92, 6 mos. Used to maintain chamber temperature at 110°F (43°C).

--Temperature Indicator/Controller: Watlow Series 808, Model 808A-0612-0000, ID/N 938, -99 to +600°F with XXX°F digital readout, $\pm 2^\circ\text{F}$. Calib. due 12-1-91, 6 mos. Used to monitor unit and chamber wall temperatures.



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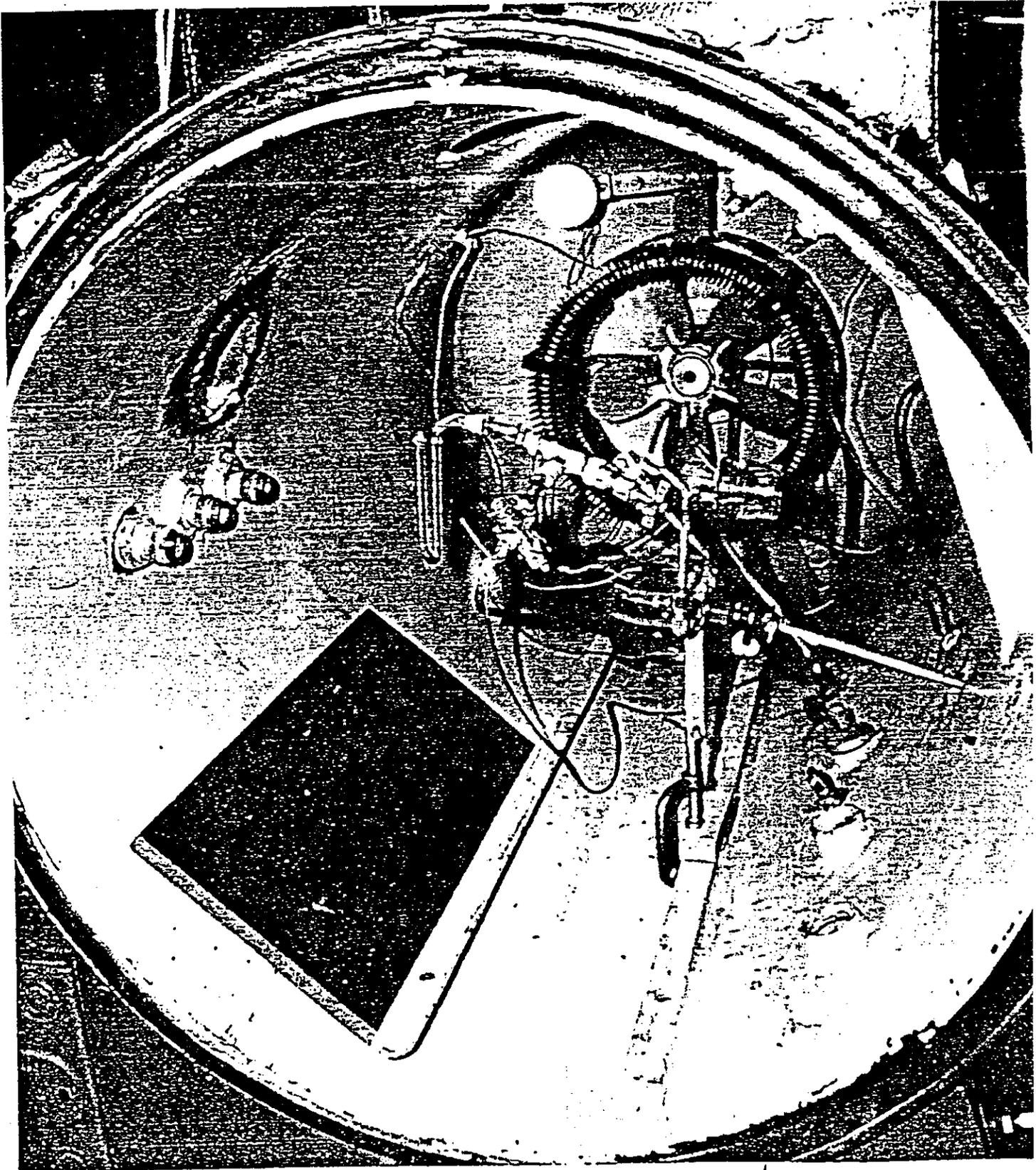
TEST REPORT

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PHOTO 1

EXPLOSION PROOF TEST SETUP





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TEST REPORT

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PHOTO 1

EXPLOSION PROOF TEST SETUP

