

REPORT: GPMS-1001-010-008
Rev. A



DATE: December 6, 2020

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GPMS 
Green Power Monitoring Systems

GPMS-1001-010-008

Flammability Test Results,

Fire Retardant/Cellular/GPS/WIFI Antenna

Bell 212/412

REVISION A

DATED: December 6, 2020

FAA Project ST02808AC-R

Prepared by:
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LOG OF REVISIONS

If revisions are required to this document, the entire document will be updated and re-released.

Revision	Date	Description	Affected Pages
IR	11/12/2020	Initial Release	All
A	12/06/2020	Added test results	12-15

FLAME SAFE CHEMICAL CORPORATION

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List of References

1. 14 CFR, Part 29, Airworthiness Standards: Transport Category Rotorcraft
2. Project Specific Certification Plan Installation of Foresight MX on Bell 212/412, FAA Project: ST02808AC-R, Document No. BAS-212412-901-1001, Revision E, Date: 9-25-20.
3. Aircraft Materials Fire Test Handbook, DOT/FAA/AR-00/12, April 2000.

FLAME SAFE CHEMICAL CORPORATION

1. Introduction

The purpose of this Flammability Test Plan is to provide the procedures to be used for the evaluation of interior materials that require compliance with FAR 29.853(a)(2) for the GPMS Cellular/GPS/WIFI Antenna.

2. Description

The part to be tested is GPMS:

Fire Retardant/Cellular/GPS/WIFI/Antenna Drawing No. 1001.010.008, Rev. 01

3. Certification Basis

The flammability aspects of the latest model 412EP are certified to 14 CFR Part 29.853(a)(2), Amendment 29-23. The antenna made from a thermoformed material therefore 14 CFR 29.853(a)(2) requires a 12 second vertical Bunsen burner antenna assembly. The Bell 212/412 models are certified to an earlier amendment that did not require materials to be self-extinguishing, however, AC 27.583 encourages and recommends uses of self-extinguishing material. Therefore, meeting the vertical test will satisfy the requirements for all certification basis of the aircraft.

4. Definitions

Ignition time – the length of time in seconds the burner flame is applied to the test specimen. Ignition times are given in Table 1.

SPECIMEN ORIENTATION	IGNITION TIME (SEC.)
Vertical	12

Table 1. IGNITION TIMES FOR SPECIMEN ORIENTATIONS

Flame time – the length of time in seconds the specimen continues to flame after the burner flame is removed from beneath the specimen. Surface burning that results in a glow but not in a flame is not included.

Drip flame time – the length of time in seconds that any flaming material continues to flame after falling from the specimen to the floor of the chamber. In the event no material falls from the test specimen, the drip flame time is recorded to be 0 seconds and the notation "No Drip" is also reported. In the event there is more than one drip, the drip time of the longest flaming drip is recorded.

Burn length – the distance in inches from the original specimen edge to the farthest evidence of damage to the test specimen due to that area's combustion. This includes areas of partial consumption, charring and embrittlement. However, this does not include areas sooted, stained, warped, discolored, nor areas where materials have shrunk or melted away from the heat.

5. Conformity Requirements

Parts are to be supplied with an 8130-9 Statement of Conformity.

5.1. Test Setup

Test equipment requiring calibration and test chamber will be inspected to ensure that parts are calibrated and meet the requirements specified in this test plan. Test setup will be verified by the DER test witness.

5.2. Test Articles

The specimens of each material to be tested will be prepared and subjected to a conformity inspection against the FAA approved type design drawings identified for each specific project including verification of the following:

- A) Classification of test to be conducted
- B) Material used
- C) Material source
- D) Material P/N
- E) Lot or batch number (if applicable)

6. Test Application Description

The following equipment and calibration requirements must be met.

6.1. Required Equipment

- A) Conditioning Chamber: Test specimens will be conditioned in a chamber that will maintain a temperature of 70 +/- 5 degrees Fahrenheit.
- B) Temperature/Humidity Recorder: Temperature/Humidity Recorder will be used to show the condition chamber temperature/humidity is within the proper range.
- C) Test Cabinet: Tests will be conducted in a draft-free cabinet fabricated in accordance with Figure 1.
- D) Vertical Specimen Holders: Must hold the specimen such that it remains vertical and is 3/4 inch above the burner (Figure 2).
- E) Burner: The burner will be a Bunsen or Tirrill type having a 3/8 inch inside diameter barrel and be equipped with a needle valve located at the bottom of the burner barrel to adjust the gas flow rate and thereby adjust the flame height. There will be means provided to move the burner into and out of test position with the cabinet door closed.
- F) Burner Fuel: Methane gas with 99 percent minimum purity will be used. A control valve system with a delivery rate designed to furnish gas to the burner under a pressure of $2\text{-}1/2 \pm 1/4$ psi at the burner inlet will be used between the gas supply and the burner (or later revision).
- G) Flame to Specimen Location: The flame position for each test type will be in accordance with AIRCRAFT MATERIALS FIRE TEST HANDBOOK dated 4/00 or later revision. See Figure 2.
- H) Thermocouple/Indicator: A calibrated thermocouple and indicator are required to determine the flame temperature.
- I) Timer: A stopwatch or other device with accuracy to hundredths of second will be used to measure the time of application of the burner flame, the flame time, and the drip time.
- J) Ruler: A ruler or scale graduated to the nearest 0.1 of an inch will be used to measure the burn length.

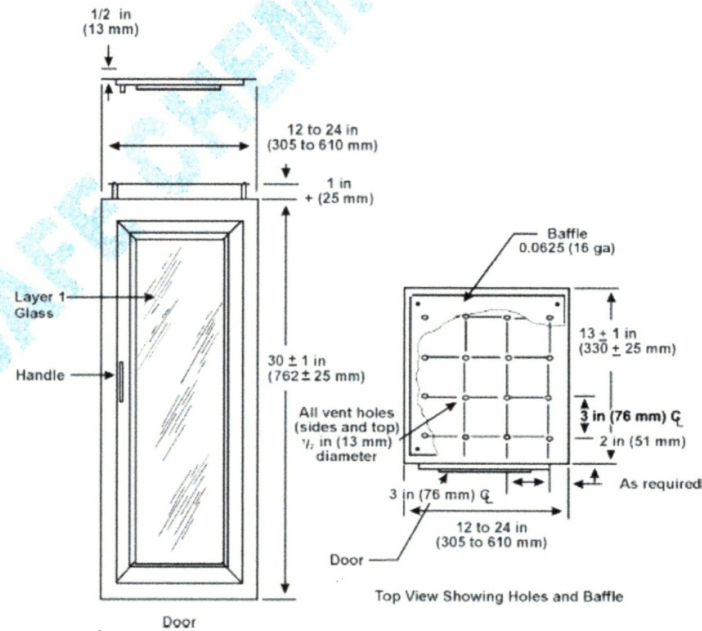
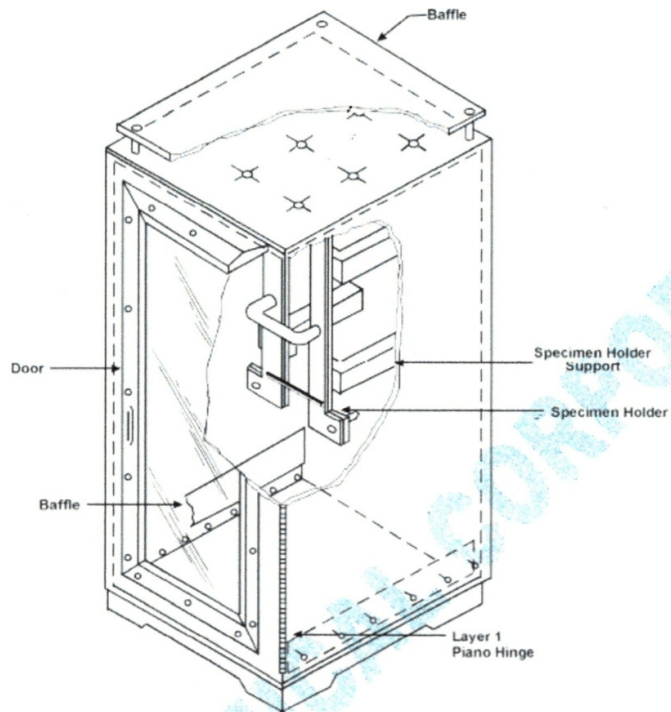


Figure 1. Vertical Test Cabinet

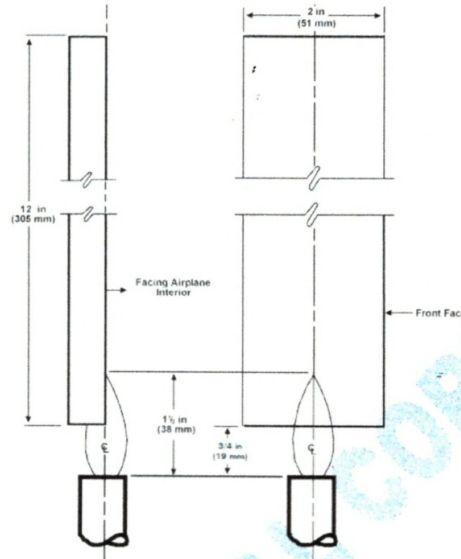


Figure 2. Vertical Burner and Specimen Location

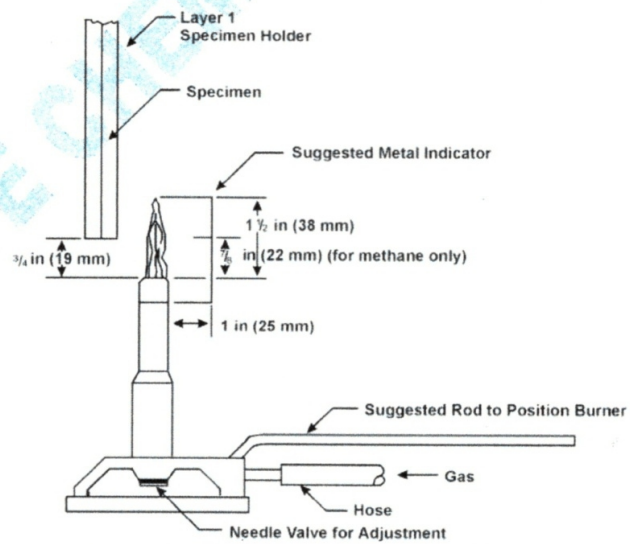


Figure 3. Vertical Test Flame Height

6.2. Equipment Calibration

The equipment required to be calibrated for the flammability test are:

- A) Temperature/Humidity Recorder
- B) Thermocouple/Indicator
- C) Stopwatch

Calibration of equipment must be performed by an American Association for Laboratory Accreditation (A2LA) accredited laboratory in accordance with ANSI / NCSL Z540-1 American National Standard "Calibration Laboratories and Measuring and Test Equipment – General Requirements".

7. Testing Information

7.1. Test Requirements

- A) Specimen Size
The specimens will be the actual antenna with cables.
- B) Specimen Conditioning
Specimens will be conditioned at 70±5 degrees F and 50±5% relative humidity for 24 hours minimum. Conditioning chamber is monitored by a calibrated recorder that continuously monitors the chamber's temperature and humidity. Only one specimen at a time will be removed from the conditioning environment immediately before testing. Each set of specimens is logged into and out of the conditioning chamber on the Flammability Test Data Sheet.

7.2. Vertical Test Procedure

- A) Burner Adjustment
 1. Methane (99%) will be used therefore ensure that the air supply to the burner is shut off.
 2. Open the stopcock in the gas line fully and light the burner.
 3. Adjust the needle valve on the burner to achieve the proper 1.5 inch (38 mm) flame height in accordance with Figure 3.
 4. Measure and record flame temperature and height on Flammability Test Data Sheet. Minimum temperature is 1550°F.
- B) Test Procedure
 1. Place the burner at least 3 inches (76 mm) from where the specimen will be located during the test.
 2. Insert the specimen with its lower edge 3/4 inch (19 mm) above the level of the top of the burner
 3. Close the cabinet door, and keep it closed during the test.

4. Start the timer immediately upon positioning the burner. Position the burner so that the flame impinges on the midpoint of the lower edge of the front face of the test specimen. This position should be used for all specimen thicknesses.
5. Apply the flame for 12 seconds and then withdraw it by moving the burner at least 3 inches (76 mm) from the specimen or by turning the gas off.
6. Determine the flame time for the specimen.
7. After all flaming ceases, open the cabinet door slowly to clear the test cabinet of fumes and smoke. The exhaust fan may be turned on to facilitate clearing of smoke and fumes.
8. Remove the specimen and determine the burn length. To aid in determining the burn length, a dry soft cloth or tissue, or a soft cloth or tissue dampened with a moderate solvent, such as methyl, ethyl, or isopropyl alcohol (which does not dissolve or attack the specimen material), may be used to remove soot and stain particles from tested specimens.
9. Remove any material from the bottom of the cabinet that fell from the specimen. If necessary, clean the test cabinet window and/or back face mirror prior to testing the next specimen.

C) Test Results

1. Ignition Time – 12 seconds
2. Flame Time – Report the flame time for each specimen tested. Determine and record the average value for flame time.
3. Drip Flame Time – Report the drip flame time for each specimen tested. Determine and record the average value for the drip flame time. For specimens that have no drips, record "0" for the drip flame time and also record "No Drips".
4. Burn Length – Report the burn length to the nearest 0.1 inch for each specimen tested. Determine and record the average value for burn length.

7.3. Vertical Pass/Fail Requirements

Specimen Testing Requirements:

Flame Time – the average flame time for all specimens tested will not exceed 15 seconds.

Drip Flame Time – the average drip extinguishing time for all of the specimens will not exceed 5 seconds.

The average burn length for all of the specimens tested will not exceed 8 inches (203 mm).

Determine Pass/Fail and Record on Data Sheet.

8. Test Specimen Specifications

Three test specimens of part number 1001.010.008 will be tested. The parts are approximately 6.0" x 2.75" x 0.51" with four cables with MIL-DTL-23053/4 shrink tubing. The parts have been coated with Flame Safe Chemical Corporation Fire Poly FPCC.

9. Test Facility

The burn testing shall be conformed to this test plan at the location listed below:

Material Testing & Certification, LLC
1002 Cresthaven Drive
Euless, TX 76039

10. Test Results

All parts self-extinguished as soon as the flame was removed. An additional test was performed at the wire interface with the same results. The test is passed the requirements. See Data Sheet and Figures 4-6.

FLAME SAFE CHEMICAL CORPORATION

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DATE: December 6, 2020

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Date Tested: November 22, 2020
Customer: GPMS, Inc
Project Number: ST02808AC-R
FAR Requirement: 29.853(a)(2) [29-23] / Part 25 Appendix F Part 1 (a)(1)(ii)

VERTICAL FLAMMABILITY TEST RESULTS

Specimen Conditioning

Time in Conditioning Chamber: Date: 11/20/2020 Time: 4:55 pm

Time out Conditioning Chamber: Date: 11/22/2020 Time: 2:33 pm

(Must be conditioned at 70°F ± 5 °F and 50 ± 5 % Relative Humidity) Verified by: LB

Specimen Nomenclature: **Fire Retardant/Cellular/GPS/WIFI/Antenna**

Specimen Part Number: 1001-010-008, Rev. 01 Conformity Performed: 8130-9 delivered with parts

Specimen Size: Length: 5.97" Width: 2.33" Thickness: 0.51"

Flame Temperature (°F): 1986°F (1550°F Minimum)

Flame Height: (in): 1.5 inches

Specimen Number	Ignition Time (seconds)	Flame Time (seconds)	Drip Flame Time (seconds)	Burn Length (inches)
1	12	0	0	0.13
2	12	0	0	0.13
3	12	0	0	0.13
Average	12	0	0	0.13

Requirement: Ignition Time is 12 seconds Average
Flame Time must not exceed 15 seconds
Drip Extinguishing Time must not exceed 5 seconds
Average Burn Length must not exceed 8 inches

Notes: All parts self-extinguished as soon as the flame was removed. An additional test was performed at the wire interface with the same results. The test is passed the requirements. See Figures 4-6

Pass: Fail:

FAA DER Witness Louis Bellott

Louis E Bellott

Digitally signed by Louis E Bellott
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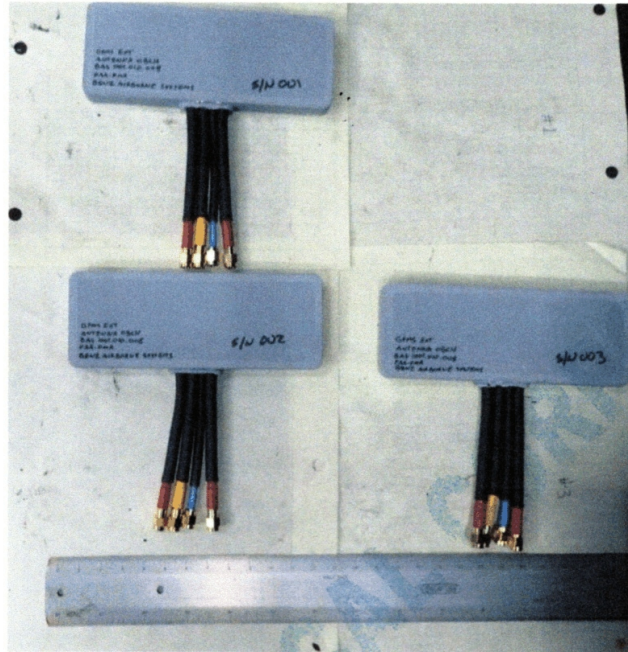


Figure 4. Pre Test Specimens



Figure 5. Post Test Specimens

