

## Chapter C2

### Oil Burner Test for Cargo Liners

#### C2.1 Scope

##### C2.1.1 Applicability

This test method evaluates the flame-penetration resistance capabilities of aircraft cargo compartment lining materials using a high-intensity open flame to show compliance to the requirements of 14 CFR 25.855.

#### C2.2 Definitions

##### C2.2.1 Burnthrough

Burnthrough is defined as flame penetration of the test sample or the development of a visible breach, opening, gap, fissure, or any void through which a flame penetrates during the test. The development of any such void that allows burnthrough during the test period shall be cause for failure.

##### C2.2.2 Test Sample

A test sample consists of a ceiling (horizontal) and sidewall (vertical) cargo liner panel installation. A sample may also consist of a cargo liner panel installation (ceiling or sidewall) and fire-resistant baffle (see section C2.4.1.1 for details).

#### C2.3 Apparatus

##### C2.3.1 Test-Sample Apparatus

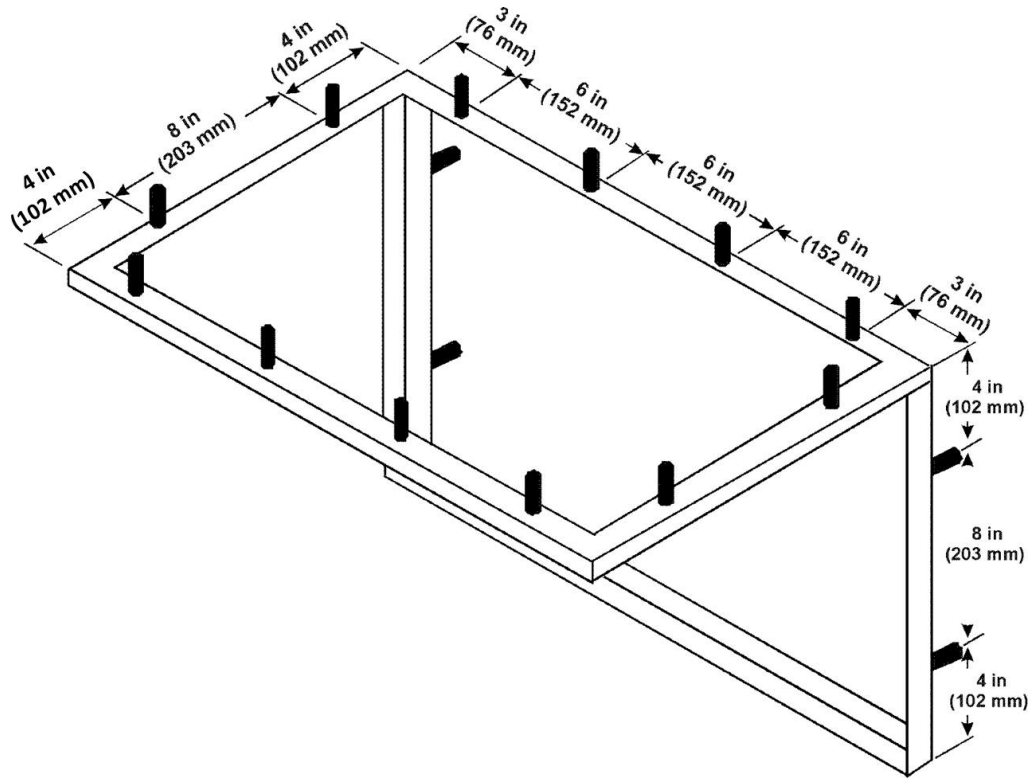
The test-sample apparatus includes the test-sample mounting frame (see figure C2-1), a sidewall (vertical) test-sample retaining frame (see figure C2-2), and a ceiling (horizontal) test-sample-panel retaining frame (figure C2-3). Test-sample panels are placed between the mounting frame and retaining frames. The test-sample apparatus must allow movement of the test sample so it can be positioned above the burner at the proper distance (see figure C2-4). It is recommended that the test-sample-apparatus have the capability of being positioned a minimum of 36 inches (914.4 mm) from the burner cone to prevent preheating of the sample during the burner warmup period.

*NOTE: The sample frame may be positioned closer to the burner cone during warmup but may create a more severe test condition.*

##### C2.3.1.1 Test-Sample Mounting Frame

The test-sample mounting frame will be fabricated of 1- by 1- by 0.125-inch (25- by 25- by 3-mm) stainless-steel angle and bolts as shown in figure C2-1. The frame is symmetrical with respect to the dimensions and position of the bolts. The bolts are positioned on the

centerline of the angle iron and welded into position. The test-sample panels are mounted to the outer surfaces of the sample mounting frame.



**Figure C2-1. Test-sample mounting frame**

#### C2.3.1.2 Test-Sample Retaining Frame

Two test-sample retaining frames are required: one for the sidewall (vertical) test panel (see figure C2-2) and one for the ceiling (horizontal) test panel (see figure C2-3). Each test-sample retaining frame will be fabricated of a 1- by 1- by 0.125-inch (25- by 25- by 3-mm) stainless-steel angle with holes machined, as shown in figure C2-2. The machined holes should be sized accordingly to fit over the bolts on the test-sample mounting frame. Bolt or stud size is typically  $\frac{1}{4}$ -20 thread and long enough to sufficiently accommodate the thickness of the sample and sample frames. The ceiling (horizontal) retaining frame requires additional 1- by 1- by 0.125-inch (25- by 25- by 3-mm) stainless-steel angle components for mounting a 0.625-inch diameter thermocouple, as shown in figure C2-3. The retaining frames are placed on the outside of the test-sample mounting frame with the test-sample panels clamped between the mounting and retaining frames. Hex nuts or similar fasteners will be used in combination with the bolts on the mounting frame to secure the retaining frames and prevent the sample panels from slipping or pulling away from between the frames during testing.

*NOTE: Clamps may be used to secure the retaining frames to the sample mounting frame for some test-sample configurations. Ensure the clamps are secured sufficiently to prevent*

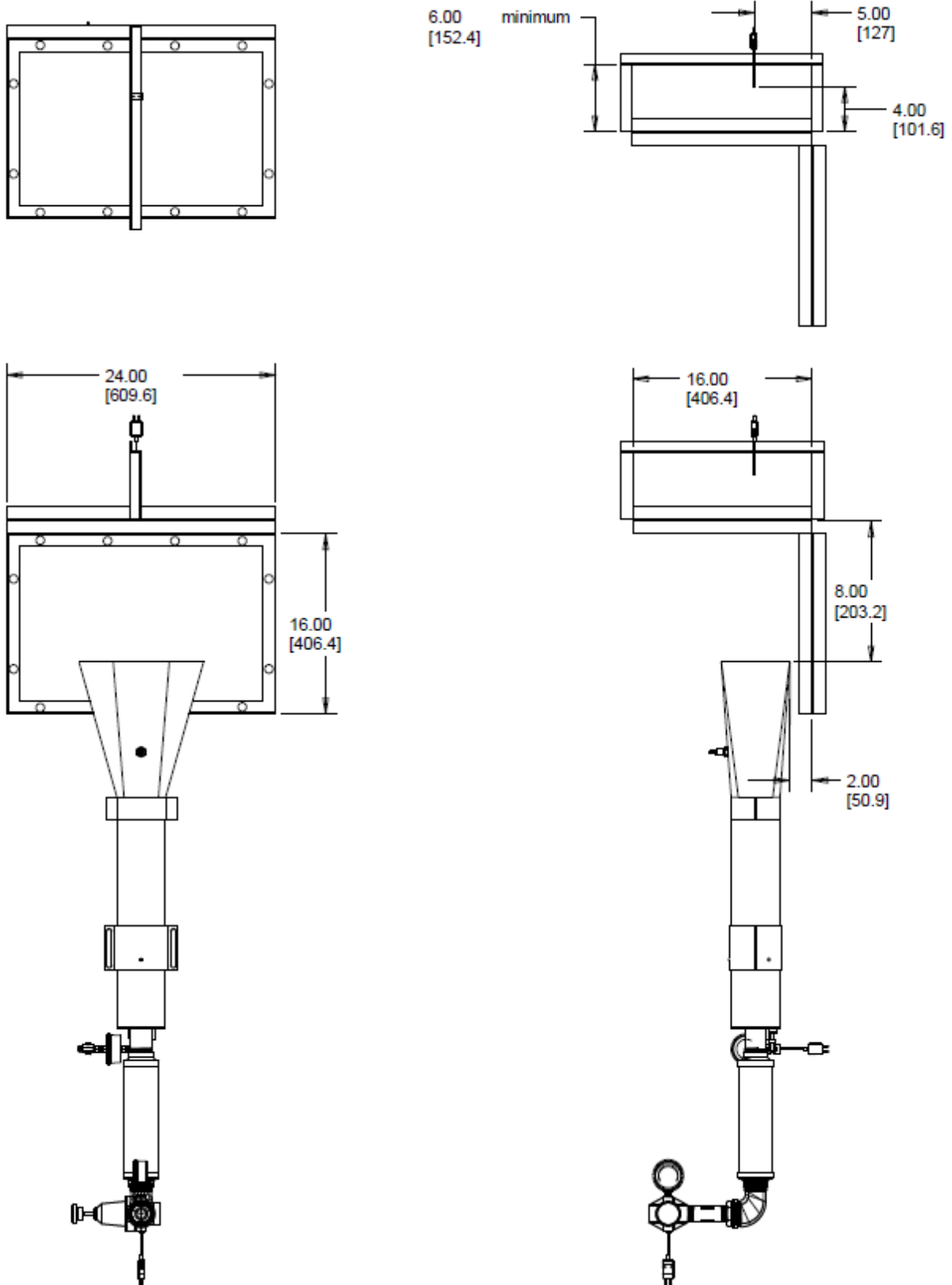
An isometric view of a rectangular frame. The frame has a central rectangular opening. The overall dimensions are 24 in (610 mm) in length and 16 in (406 mm) in width. The frame is composed of four L-shaped sections. The dimensions of the frame sections are as follows:

- Top-left section: 4 in (102 mm) wide, 8 in (203 mm) high.
- Top-right section: 6 in (152 mm) wide, 6 in (152 mm) high.
- Bottom-right section: 6 in (152 mm) wide, 3 in (76 mm) high.
- Bottom-left section: 4 in (102 mm) wide, 6 in (152 mm) high.

The frame is shown in a perspective view, with the dimensions labeled in inches and millimeters.

**Note:** This figure shows the preferred method of mounting the 0.0625-inch thermocouple for monitoring sample backside temperatures.

**Figure C2-3. Cargo liner test horizontal sample panel retaining frame**



**Figure C2-4. Test-sample apparatus and sonic burner in the test position**

### C2.3.2 Burner

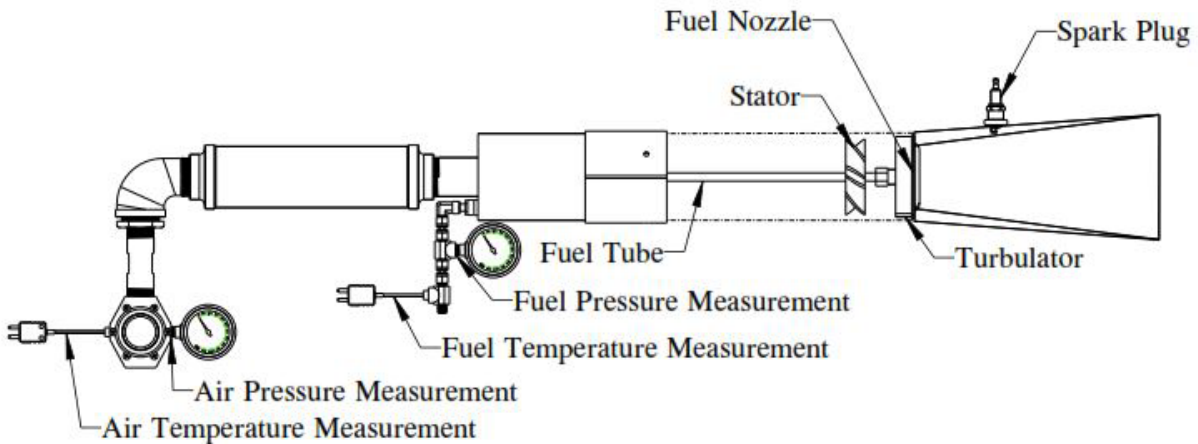
The test burner is the Sonic Fire Test Burner, described in detail in appendix K. The burner configuration for this test method is displayed in table C2-1.

**Table C2-1. Burner configuration for the cargo liner flammability test**

|      |                               |                            |
|------|-------------------------------|----------------------------|
| Fuel | Nozzle                        | 2.0 gal/hr 80° Solid Spray |
|      | Volumetric Flow Rate (gal/hr) | $2.0 \pm 0.1$              |
|      | Pressure (psig)               | $110 \pm 10$               |
| Air  | Diffusion Method              | Stator and Turbulator      |
|      | Pressure (psig)               | $45 \pm 1$                 |
|      | Mass Flow Rate (SCFM)         | 54.2                       |
|      | Burner Orientation            | Vertical                   |

#### C2.3.2.1 Inlet-Condition Measuring

To obtain an accurate measurement of the conditions entering the burner, the fuel pressure and temperature, and the air pressure and temperature measurements must be made nearest to the burner inlet (see figure C2-5). To minimize air-stream disruptions, the intake air temperature must be measured prior to the sonic nozzle.



**Figure C2-5. Inlet-condition measurement location (side view)**

#### C2.3.2.2 Fuel Nozzle

A screw-in fuel nozzle is required to maintain a fuel pressure that will yield a  $2 \pm 0.1$ -gal/hr ( $7.57 \text{ L/hr} \pm 0.38 \text{ L/hr}$ ) fuel flow. A Delavan type\_B fuel nozzle with an 80-degree solid spray angle nominally rated at 2.0 gal/hr ( $7.57 \text{ L/hr}$ ) at 100 lb/in<sup>2</sup> (0.69 MPa) has been found to deliver the appropriate flow rate and produce the proper flame pattern and is recommended. Actual flow rate measurements may deviate from the advertised flow rate. The actual flow rate must be measured manually using a flexible tube, graduated cylinder, and timing device, as described in section C2.5.4.6. The fuel pressure must then be adjusted accordingly to produce the required fuel flow of  $2 \pm 0.1$  gal/hr ( $7.57 \text{ L/hr} \pm 0.38 \text{ L/hr}$ ). For more details, refer to appendix K, section K.3.4.4, Fuel Nozzle.

#### C2.3.2.3 Fuel-Pressure Regulation

The fuel must be properly pressurized to deliver the proper fuel flow. Ideally, this pressure must be in the range of 100–120 lb/in<sup>2</sup> (0.69 to 0.83 MPa). For details on fuel pressurization and regulation, refer to appendix K, section K.3.4, Fuel System.

#### C2.3.2.4 Fuel Type

A kerosene-type fuel is used in the burner equipment. Jet A and JP-8 (military equivalent to Jet A) fuel is recommended; however, other fuels are permissible if the flame temperature can be maintained according to section C2.6.1.3. For more details, refer to appendix K, section K.3.4.6, Fuel.

#### C2.3.2.5 Burner Cone

A  $12 \pm 0.125$ -inch ( $305 \pm 3$ -mm) burner extension cone is fitted to the end of the burner draft tube. The opening must be  $6 \pm 0.125$  inches ( $152 \pm 3 \text{ mm}$ ) high and  $11 \pm 0.125$  inches ( $280 \pm 3 \text{ mm}$ ) wide. For more details, refer to appendix K, section K.3.7, Burner Cone.

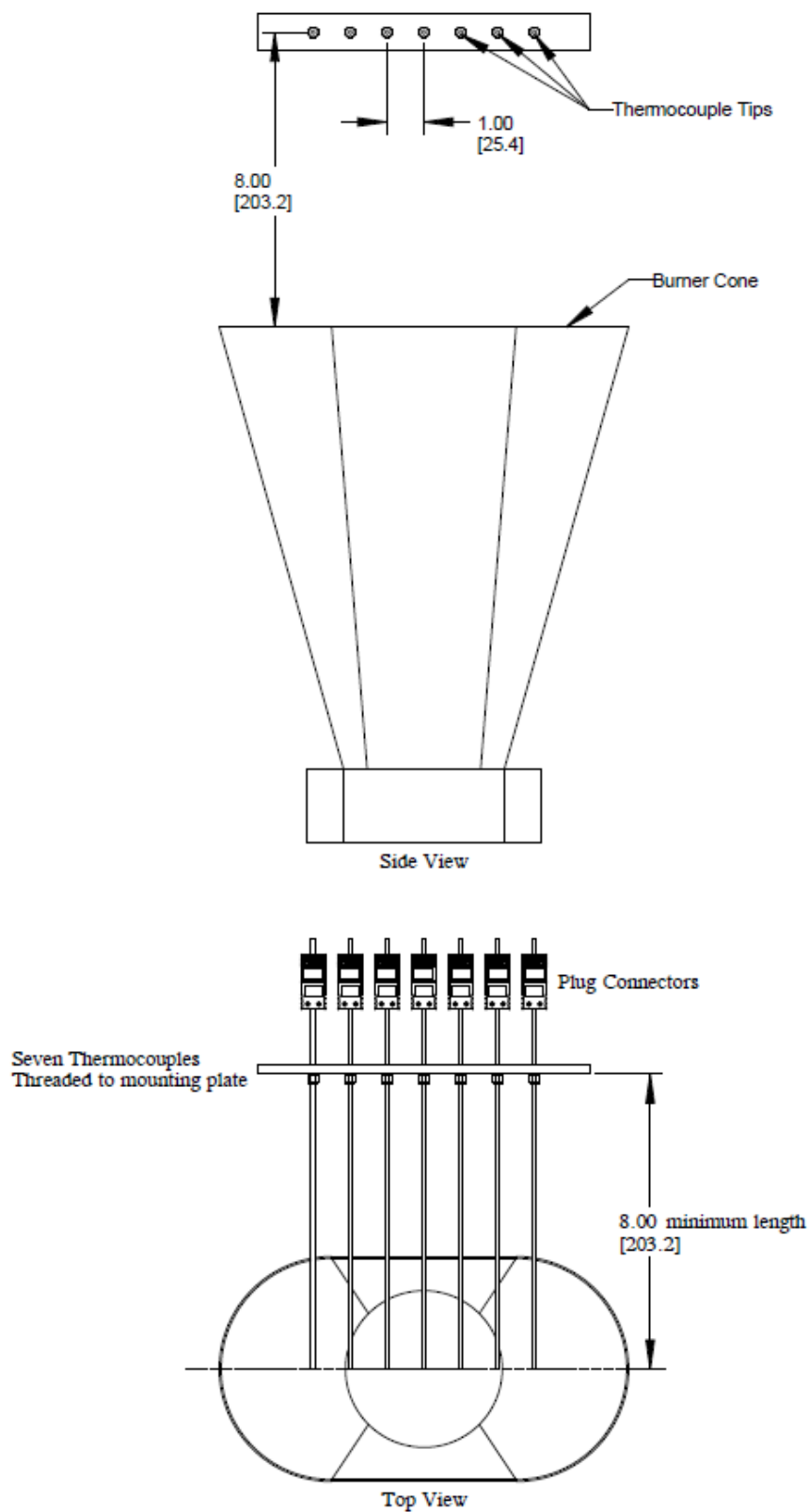
#### C2.3.2.6 Spark Plug

An automotive-style spark plug is fitted into a threaded boss, which is welded to the burner extension cone. The threaded boss is centered on the upper surface of the burner cone, at a distance of  $6 \pm 0.125$  inches ( $152 \pm 3 \text{ mm}$ ) from the intake end of the burner cone. For more details, refer to appendix K, section K.3.5, Ignition System.

### C2.3.3 Burner Flame Consistency Validation Thermocouples

Seven thermocouples must be used to check the flame temperature of the burner. The thermocouples must be 0.125-inch (3.2 mm) in diameter, insulation packed, 310 stainless-steel sheathed, type K (chromel-alumel), grounded junction with a nominal 24 American Wire Gauge (AWG) size conductor. Thermocouples purchased with a certificate of calibration may provide more accurate readings but are not required. The seven thermocouples must be attached to a steel mounting plate to form a thermocouple rake for placement above the burner

cone during the burner-flame consistency validation procedure (see figure C2-6). It is recommended the thermocouple mounting plate be a minimum of 8 inches (203 mm) away from the tips of the thermocouples.



**Figure C2-6. Side and top view of thermocouple rake bracket**

## C2.3.4 Instrumentation and Supporting Equipment

### C2.3.4.1 Data Acquisition

A calibrated recording device or a computerized data-acquisition system with an appropriate range must be used to measure and record the outputs of the thermocouples.

### C2.3.4.2 Sample Backside Temperature Thermocouple

A thermocouple will be used to monitor the temperature above the ceiling (horizontal) panel during cargo liner sample testing. The thermocouple must be 0.0625-inch (1.6 mm) in diameter, insulation packed, 310 stainless-steel sheathed, type K (chromel-alumel), grounded junction with a nominal 30 AWG size conductor. The thermocouple tip should be a minimum of 2 inches (51 mm) away from any hardware used to mount the thermocouple in the test position.

### C2.3.4.3 Timing Device

A stopwatch or other device, accurate to within + 1 second per 8 hours (+ 3 sec/day), must be used to measure the time of application of the burner flame, the material flaming time, and the burnthrough time.

### C2.3.4.4 Test Chamber Anemometer

A handheld vane-type or hotwire-type air velocity-sensing unit capable of measuring accurately in the 0–100 ft/min range must be used to monitor the flow of air inside the test chamber when the ventilation hood is operating. Airflow measurements should be taken at the beginning of the day prior to operating the test burner. A suitable hotwire anemometer, which may be mounted to the sample test frame, is manufactured by Dwyer Instruments, model number 641-6-LED. A suitable handheld hotwire anemometer is manufactured by TSI, model number 9515. Vane-type anemometers typically do not function properly with airflow rates less than 50 ft/min.

### C2.3.4.5 Test Chamber

A suitable test chamber must be used to reduce or eliminate the possibility of test fluctuation due to air movement. Although not required, the recommended minimum of the test-chamber floor area is 15 feet by 15 feet (4.57 m by 4.57 m) or larger.

*NOTE: Smaller test cells may experience significant increases in ambient air temperature while testing. This may increase the severity of the test.*

### C2.3.4.6 Ventilation Hood

The test chamber must have an exhaust system capable of removing the products of combustion expelled during the tests.

## **C2.4 Test Samples**

### **C2.4.1 Sample Configuration**

Each cargo-liner panel type and design configuration will be tested. Design configuration includes cargo-compartment design features, such as corners, joints, seams, lamp assemblies, pressure-relief valves, and temperature sensors that may affect the capability of a cargo compartment to safely contain a fire (see section C2.7.9).

#### **C2.4.1.1 Testing Ceiling or Sidewall Panels Individually**

Ceiling and sidewall liner panels may be tested individually if a baffle of fire-resistant material, such as Superwool<sup>®</sup> or Marinite<sup>®</sup>, is used to simulate the missing panel.

### **C2.4.2 Sample Number**

A minimum of three samples for each sample type or design configuration will be prepared for testing.

### **C2.4.3 Sample-Panel Size**

Each sample panel to be tested will measure  $16 \pm 0.125$  inches ( $406 \pm 3$  mm) by  $24 \pm 0.125$  inches ( $610 \pm 3$  mm).

### **C2.4.4 Sample Conditioning**

Samples will be conditioned at  $70^{\circ} \pm 5^{\circ}\text{F}$  ( $21^{\circ} \pm 3^{\circ}\text{C}$ ) and  $55\% \pm 10\%$  relative humidity for a minimum of 24 hours prior to testing. Remove only one sample at a time from the conditioning environment immediately before testing.

## **C2.5 Preparation of Apparatus**

### **C2.5.1 Alignment**

Mount a test sample on the test-sample frame. Level and center the sample-holder frame assembly to ensure alignment with the burner cone. Move the test-sample mounting frame into position in front of the burner, and check for proper alignment (i.e., distance from exit of burner cone to face of test sample, proper sample height with respect to cone centerline). The movable assembly should incorporate mechanical stops or detents to ensure that the samples can be moved into position quickly without measurement during testing.

### **C2.5.2 Chamber Ventilation**

Turn on the ventilation hood for the test chamber. Do not turn on the pressurized burner air. With the test sample still in place on the test frame, measure the airflow in the test chamber using a hotwire anemometer or equivalent measuring device. The vertical air velocity within a 12-inch (30.5 cm) radius from any point on the test sample must be less than 100 ft/min (50.8

cm/sec). The horizontal air velocity within a 12-inch (30.5 cm) radius from any point on the test sample must be less than 50 ft/min (25.4 cm/sec).

*NOTE 1: Airflow measurements do not have to be taken for each sample tested. It is recommended that airflow measurements be taken at the beginning of the day before testing, and at the end of the day when testing is completed.*

*NOTE 2: Personnel present within the test cell may influence air-velocity readings. This may be avoided by mounting the anemometer instrumentation to the sample mounting frame during test cell air-velocity measurements.*

### C2.5.3 Test-Chamber Air Temperature

The temperature of the test chamber should be between 50°F and 100°F (10°C and 38°C) before the start of each test. The chamber air temperature should be measured at the same height as the ceiling (horizontal) test-sample panel, within 12 inches (30.5 cm) laterally. Remove the sample from the test frame. Do not use this sample for testing. The sample may be kept for future test-chamber airflow and temperature measurements.

### C2.5.4 Sonic Burner Configuration

#### C2.5.4.1 Fuel-Nozzle Location

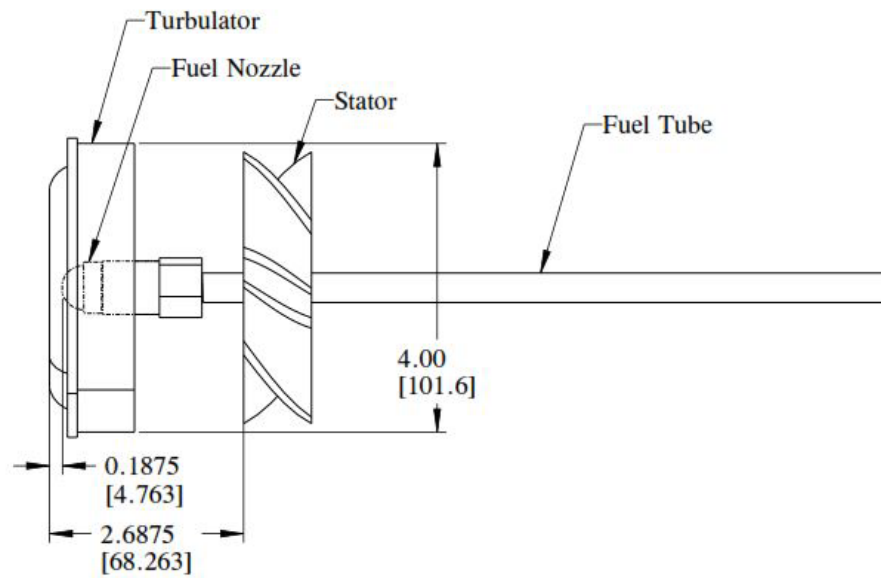
The tip of the fuel nozzle, or fuel exit plane, must be located  $0.1875 \pm 0.020$  inch ( $4.763 \pm 0.5$  mm) from the exit plane of the turbulator (see figure C2-7).

#### C2.5.4.2 Stator Adjustment

The stator is positioned by adjusting its translational position and its axial position on the fuel rod.

##### C2.5.4.2.1 Stator Translational Position

The front face of the stator must be located  $2.6875 \pm 0.020$  inches ( $68.263 \pm 0$  mm) from the exit plane of the turbulator (see figure C2-7). This stator translational position is also 2.5 inches (63.5 mm) from the tip of the fuel nozzle.

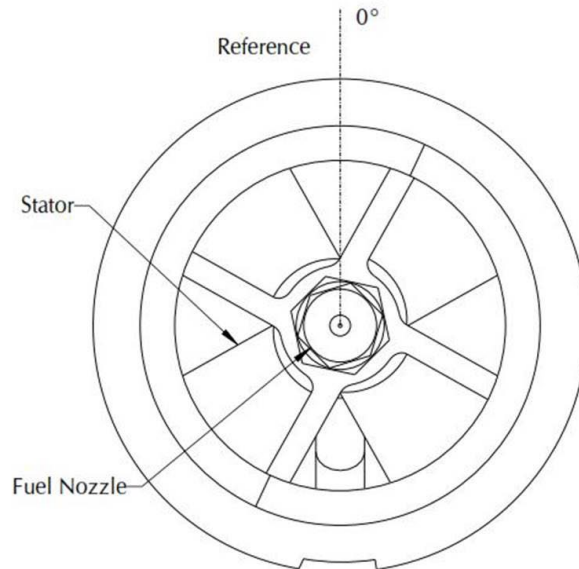


**Figure C2-7. Fuel nozzle and stator locations**

#### C2.5.4.2.2 Stator Axial Position

The line running through the geometric center of the stator and traversing through the center of the stator set screw can be used as a reference for properly orienting the rotational position of the stator. The stator must be positioned so the reference angle is 0 degrees (12 o'clock) from the zero position (see figure C2-8).

*NOTE: The 0-degree reference angle is pointed at, and perpendicular to, the inner surface of the sidewall (vertical) sample panel. The stator set screw will be oriented toward the vertical panel, whereas the notch in the turbulator will be oriented away from the vertical panel.*



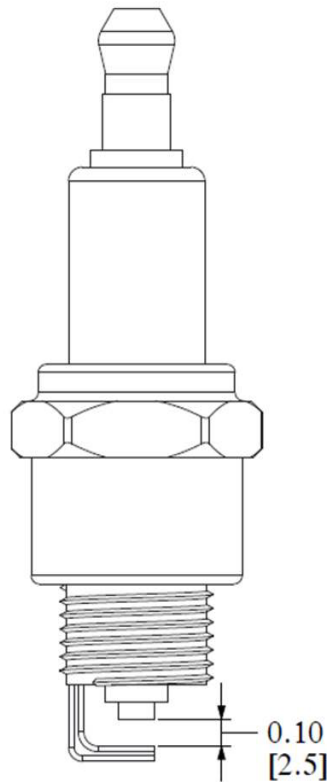
**Figure C2-8. Stator axial position viewed from above draft tube and turbulator**

#### C2.5.4.3 Spark Plug

A high-voltage oil burner ignition transformer with an output of 10 kilovolts is used to create an arc across an automotive-type spark plug mounted in the burner extension cone.

##### C2.5.4.3.1 Spark Plug Gap

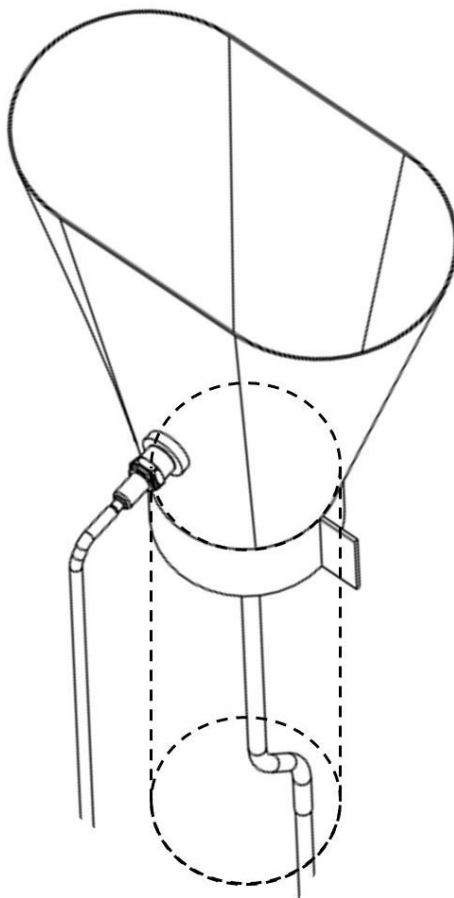
The spark plug gap (distance) between the two electrodes must be 0.100 inch (2.5 mm), as shown in figure C2-9.



**Figure C2-9. Spark-plug gap measurement**

#### C2.5.4.4 Spark-Plug Wire Routing

The length and arrangement of the spark-plug wire must be monitored to prevent heat damage during flame temperature validation and testing. Once the burner is ignited, the outside surface temperature of the burner cone will increase rapidly, becoming capable of damaging the wire if it comes in contact with the cone. The spark-plug wire should be carefully routed to prevent contact with the cone or other hot surfaces, and should also be shielded in a heat-resistant covering to further protect it from convective heat damage from the burner flames. The wire can be routed as shown in figure C2-10, in which it does not contact any components in the vicinity of the burner cone.



**Figure C2-10. Proper routing of the spark-plug wire**

#### C2.5.4.5 Volumetric Airflow Control

The volumetric airflow is controlled by a regulated sonic nozzle. Adjust the upstream supply air pressure to  $45 \pm 1 \text{ lb/in}^2$  ( $0.31 \pm 0.007 \text{ MPa}$ ). The intake air temperature must be maintained within the range of  $40^\circ\text{F}$ – $60^\circ\text{F}$  ( $4^\circ\text{C}$ – $16^\circ\text{C}$ ). For more details, refer to appendix K, section K.3.2, Combustion Air Control.

#### C2.5.4.6 Fuel-Flow Calibration

If a calibrated flow meter is not available, measure the fuel flow directly using a length of Tygon tubing and appropriately sized graduated cylinder. Slip the Tygon tubing over the end of the fuel nozzle, making certain to establish a good seal. Direct the exit of the Tygon tubing into a small bucket or other collection basin. Turn on the fuel solenoid, making sure the ignition system is off. After establishing a steady stream of fuel flow, simultaneously direct the tubing exit into the graduated cylinder while beginning the stopwatch or timing device. Do not disturb or move the tube while collecting fuel in the graduated cylinder. Collect the fuel for a 2-minute period, making certain to immediately remove the graduated cylinder from the fuel stream at precisely 2 minutes. Calculate the flow rate, and ensure that it is  $2 \pm 0.1 \text{ gal/hr}$  ( $7.57 \pm 0.38 \text{ L/hr}$ ). If the flow rate is not within the tolerance, adjust

the fuel pressure accordingly. Record the fuel pressure necessary to achieve the required fuel flow. The recorded fuel pressure must be monitored and maintained during burner operation, and fluctuate no more than  $\pm 2 \text{ lb/in}^2$  ( $\pm 0.0138 \text{ MPa}$ ) during flame-consistency validation and sample testing. A flame temperature validation or sample test will be void should the fuel pressure fluctuate outside of this range during either procedure. The temperature of the fuel must be maintained within the range of 32°F–52°F (0°C –11°C).

*NOTE: Because of the vertical orientation of the cargo liner test burner, the tube may need to fill with fuel directly above the fuel nozzle before a steady stream of fuel will flow freely from the tube end. It is recommended the fuel flow steadily from the tube end for a minimum 10-second period before collecting fuel in the graduated cylinder.*

## **C2.6 Burner Flame Consistency Validation**

### **C2.6.1 Sonic Burner**

The sonic burner used in the test must be checked to ensure the proper flame temperature is being produced for consistent and accurate test results.

C2.6.1.1 Move the test-sample apparatus from the test position to the warmup position. Examine and clean the burner cone of any evidence of buildup of combustion products and soot. Soot buildup inside the cone may affect the flame characteristics and cause flame temperature validation difficulties. Check to ensure the burner-cone dimensions are within specified tolerances before flame validation.

C2.6.1.2 Mount the thermocouple rake on a movable stand that is capable of being quickly translated into position in front of the burner. Move the rake into the flame-validation test position and check the distance of each of the seven thermocouples to ensure that they are located  $8 \pm 0.125$  inches ( $203 \pm 3 \text{ mm}$ ) from the horizontal plane of the burner cone exit. Ensure that the horizontal centerline of the thermocouples is directly above the horizontal centerline of the burner cone (see figure C2-6). Place the tip of the center thermocouple (thermocouple number 4) above the center of the burner cone exit. Note that the movable thermocouple rake stand must incorporate detents that ensure proper centering of the thermocouple rake with respect to the burner cone, so that rapid positioning of the rake can be achieved during the validation procedure. Once the proper position is established, move the thermocouple rake away and move back into the flame-temperature validation position to recheck distances. When all distances and positions are confirmed, move the thermocouple rake away from the burner.

C2.6.1.3 While the thermocouple rake is away from the burner, turn on the igniters, pressurized air, and fuel flow, and light the burner. Allow the burner to warm up for 2 minutes. After warmup, move the thermocouple rake into position and allow 1 minute for thermocouple stabilization, then record the temperature of each of the seven thermocouples once every second for 30 seconds. Remove the thermocouple rake from the flame-temperature validation position, and turn off the burner. Calculate the average temperature of each thermocouple over this period and record. Although not a requirement for testing, the recommended average temperature of each of the seven thermocouples

should be 1700°F + 100°F (927°C + 55°C). The burner should be rechecked to ensure it is configured properly if temperatures are measured outside of this recommended range. A flame that appears biased to one side or produces significantly higher temperatures on one end of the flame validation thermocouple rake may indicate that an adjustment of the fuel nozzle/ internal stator orientation/distance from the end of the draft tube may be necessary if the adjustments remain within allowable tolerances. If no problems are found with the burner, any thermocouple reading outside of this range may require replacement. It is recommended that the burner flame temperature be validated at the beginning and end of each day testing is performed.

*NOTE 1: The thermocouples are subjected to high-temperature durations during calibration. Because of this type of cycling, the thermocouples may degrade with use. Small but continuing decreases or extreme variations in temperature, or no temperature reading at all, are signs that the thermocouple or thermocouples are degrading, or open circuits have occurred. In this case, the thermocouple or thermocouples should be replaced to maintain accuracy in calibrating the burner. It is recommended that a record be kept for the amount of time the thermocouples are exposed to the oil burner's flame.*

*NOTE 2: The sonic burner is sensitive to proper alignment of the fuel nozzle. It is crucial that the fuel nozzle be aligned to the geometric center of the turbulator. A slight adjustment of the fuel tube between the stator and fuel nozzle may be required to obtain an even temperature profile across the thermocouple rake. The center point of the nozzle where the fuel exits should not deviate more than 0.0625 inch from the geometric center of the turbulator exit plane when looking into the burner draft tube. This should be performed only after checking the burner for proper configuration.*

## **C2.7 Test Procedure**

C2.7.1 Examine and clean the cone of soot deposits and debris. Remove any debris or remains of prior test samples from the test-sample frames.

C2.7.2 Position the test-sample panels in the appropriate locations on the sample mounting frame. Place the two sample retaining frames over the sample panels and secure the retaining frames to the sample mounting frame. Move the sample frame assembly into the test position.

C2.7.3 Mount the backside temperature thermocouple tip  $4 \pm 0.125$  inches ( $102 \pm 3$  mm) above the top surface of the ceiling (horizontal) sample test panel and align with the center of the burner cone exit. Verify the ceiling (horizontal) test frame is level.

C2.7.4 Move the sample frame assembly away from the burner to the standby position so the flame does not impinge on the test sample during the warmup period. Turn on the burner and allow it to stabilize for 2 minutes.

C2.7.5 Begin the test by moving the test-sample apparatus into the test position, and start the timing device when the sample is fully in the test position.

C2.7.6 Record the temperature measured by the sample backside thermocouple at least once a second for the duration of the test.

C2.7.7 Expose the sample to the flame for 5 minutes or until flame penetration occurs.

C2.7.8 Turn off the burner to terminate the test.

C2.7.9 The following sections present testing procedures for patch repairs, seams, joints, fastening systems, lighting fixtures, and corners.

#### C2.7.9.1 Patch Repairs

Reference FAA Advisory Circular (AC) 25.855-1 for details on the proper testing of patch repairs.

#### C2.7.9.2 Seams, Joints, Fastening Systems, Lighting Fixtures, and Corners

The barrier material used for design features, such as recessed lighting fixtures and pressure-relief valves, will be tested in the same manner as a cargo liner sample. Seams, joints, and fasteners in the ceiling position will be tested longitudinally, extending the length of the liner and centered over the burner cone. Seams or joints used on the sidewall will be positioned longitudinally, 2 inches from the top of the vertical test-sample panel, as representative of the aircraft application. Apply the test procedures in sections C2.7.1 through C2.7.8 to test these design features.

### C2.8 Report

C2.8.1 Report the number of samples tested and a complete description of the material(s) being tested, including manufacturer and thickness.

C2.8.2 Report the orientation of the panels tested (i.e., ceiling/sidewall).

C2.8.3 Record any observations regarding the behavior of the test sample during flame exposure, such as delamination, resin ignition, smoke, and the time each event occurred.

C2.8.4 Report the time of occurrence of flame penetration, if applicable, for each of the samples tested.

C2.8.5 If flame penetration does not occur, report the maximum temperature measured by the sample backside thermocouple and time of occurrence.

C2.8.6 Provide a record of flame-temperature validation.

*NOTE: Although not required, it may be useful to record the date, time, ambient air temperature, humidity level, and any other data that may be used to study the burn characteristics of the samples.*

### C2.9 Requirements

C2.9.1 None of the three samples tested will burn through within the 5-minute flame exposure.

C2.9.2 None of the three samples tested will exceed 400°F (204°C) measured by the backside temperature thermocouple during flame exposure.

C2.9.3 For the patch adhesion test, the patch must be intact after the 5-minute flame exposure for each of the three samples.

C2.9.4 If one or more samples fail to meet the above requirements, it is possible to run additional tests if 80 percent or more of the total number of samples meets the requirements. For example, if one of the three original samples fails the test requirement, two additional passing tests can be conducted for a total of four passing tests in five opportunities ( $4/5 = 80\%$ ).

*NOTE: The additional testing is intended for materials that typically meet the test requirements but have experienced an unexpected failure for unknown reasons. These failures, often referred to as rogue failures, are unanticipated and cannot be explained. Additional testing should not be viewed as a technique for meeting the requirement with inferior materials.*

C2.9.5 Samples that pass in the ceiling orientation may be used as a sidewall panel without further tests.

*NOTE: Flames may appear on the outer surface of the test sample resulting from the ignition of flammable smoke/gases produced from the sample when subjected to the burner flame. This does not constitute burnthrough. Burnthrough occurs only if the flame from the burner passes through the sample material. Whereas there are no specific requirements related to backside burning, more than 60 seconds of burning on the sample backside is indicative of a less-reliable material. However, the sample material is considered to be a failure if the 400°F criteria is exceeded.*