SAE Aerospace
An SAE International Group

AEROSPACE RECOMMENDED PRACTICE

SAE ARP1862 REV. A

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Superseding ARP1862

CLEANING EFFICIENCY OF TURBINE ENGINE GAS PATH CLEANERS
Laboratory Test Method

1. SCOPE:

This SAE Aerospace Recommended Practice (ARP) covers a laboratory procedure for determining the cleaning efficiency of aircraft turbine engine gas path cleaners. Results are indicative of cleaning compound performance in the compressor sections of installed aircraft turbine engines, when used in a starter crank/soak/rinse application.

1.1 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this recommended practice to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 4037 Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM D 1193 Reagent Water

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-L-23699 Lubricating Oil, Aircraft Turbine Engines, Synthetic Base

3. APPARATUS:

3.1 Soil Preparation:

3.1.1 One-quart (1-L), wide-mouth glass jar.

3.1.2 Glass tube, 0.25 in (6 mm) ID, connected to a metered air supply.

3.1.3 Oven capable of 240 °C ± 5 (464 °F ± 9).

3.2 Cleaning Efficiency Test:

3.2.1 Impeller-type mixer.

3.2.2 Scotchbrite (fine) flapbrush, or equivalent. (See 13.1.1.)

3.2.3 Analytical balance accurate to 0.1 mg.

3.2.4 Acid brush with short stiff bristles.

3.2.5 Cleaning apparatus designed according to the dimensional requirements of Figures 1 and 2.

3.2.5.1 The nozzle shall always be perpendicular to the test panel as it travels back and forth at the rate of eight to ten complete passes per minute (See Figure 2).

3.2.5.2 The test panel shall remain vertical while rotating at 220 rpm ± 10 throughout the cleaning and rinsing cycles.

3.2.5.3 The nozzle tip shall remain 3.3 in ± 0.1 (84 mm ± 2.5) from the test panel throughout the cleaning and rinsing cycles.

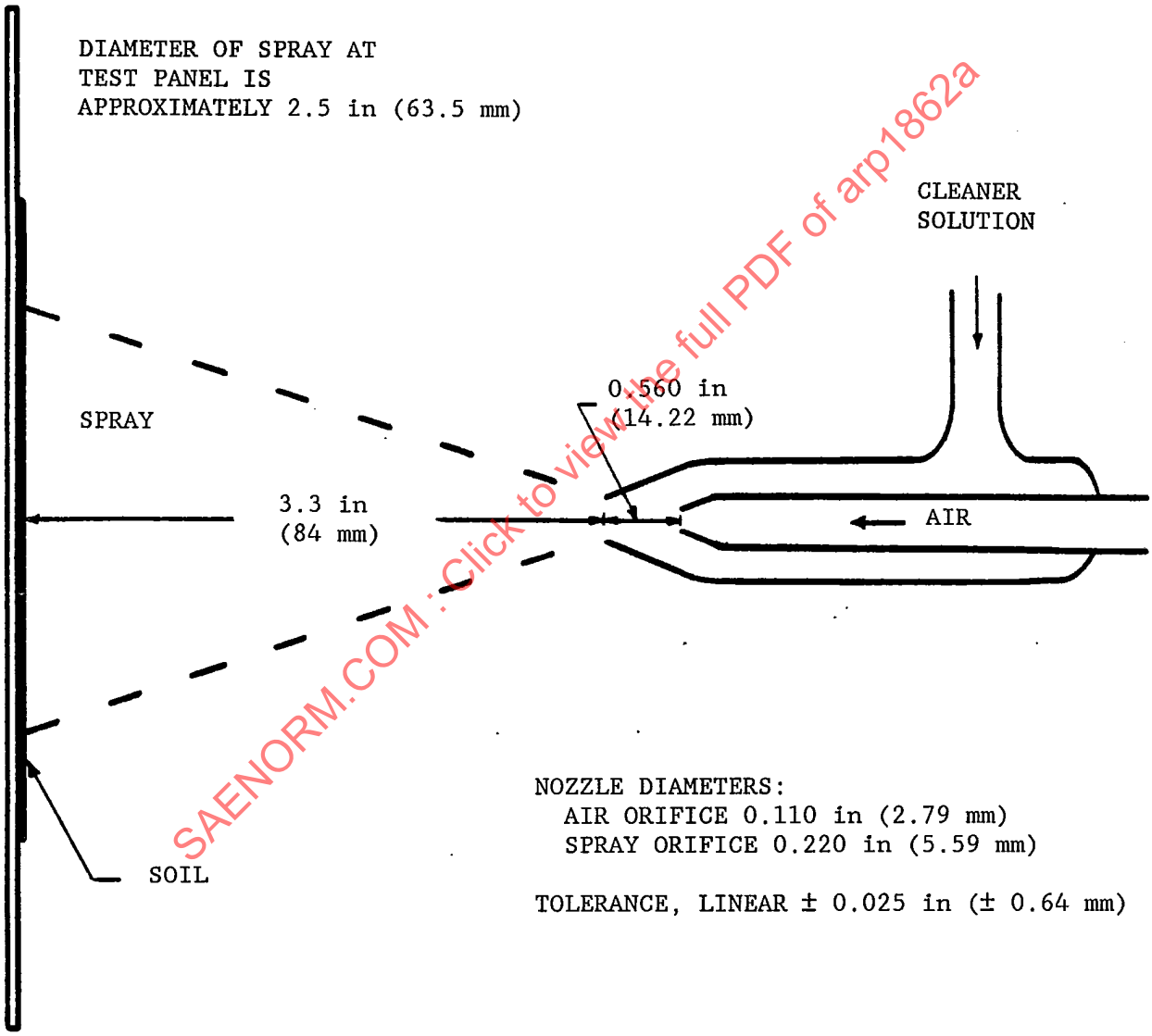

FIGURE 1 - Side View of Test Apparatus

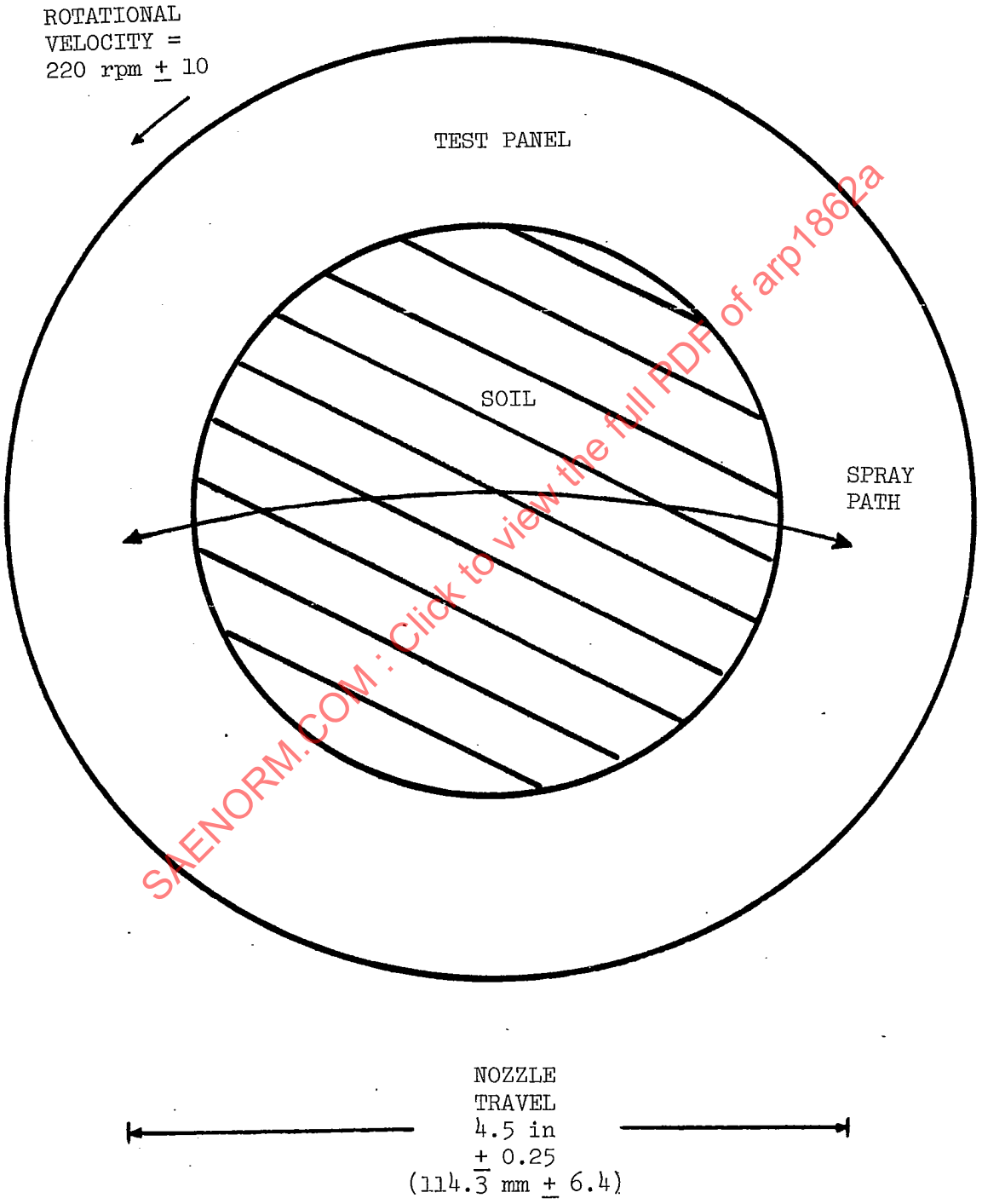

FIGURE 2 - Front View of Test Panel

4. MATERIALS:

4.1 Aluminum Alloy Test Panel:

Shall be a circular AMS 4037 aluminum alloy panel, nominally 6.0 in (152 mm) in diameter and 0.020 in (0.51 mm) in thickness, scribed with a 3.75 in ± 0.05 (95.2 mm ± 1.3) circle, centered on the panel.

4.2 Synthetic Soil:

4.2.1 Lubricating oil conforming to MIL-L-23699.

4.2.2 Carbon black; (see 13.1.2).

4.3 Control Formula Cleaner:

Prepare the control formula by mixing the ingredients shown in Table 1, in the order listed, using an impeller-type mixer:

TABLE 1 – Composition

Ingredient	% by Weight
Solvent G (see 13.1.3)	40
Oleic acid	8
Triethanolamine	10
Nonylphenoxypoly (ethylene oxy) ethanol (containing 15 moles ethylene oxide)	11
Hexylene gylcol	8
Ethylene glycol monobutyl ether	8
ASTM D 1193, Type IV, water	15

4.4 Solvents:

4.4.1 Reagent Grade Toluene

4.4.2 Reagent Grade Isopropanol

4.4.3 ASTM D 1193, Type IV, water

4.5 Miscellaneous:

4.5.1 1 L graduated cylinder

4.5.2 Absorbent tissue

5. SAFETY PRECAUTIONS:

5.1 The solvents used to clean test panels are flammable and harmful if inhaled. Keep away from sparks and open flames. Avoid breathing vapors and contact with skin. Use with adequate ventilation.

5.2 Preparation of the synthetic soil may produce harmful vapors and should be performed in a suitable exhaust hood.

5.3 Aircraft turbine engine cleaners may contain flammable solvents, acids, alkalis, or toxic compounds. Suitable precautions should be taken to prevent personnel injury. It is recommended that the cleaning test be conducted in a suitable exhaust hood.

6. SOIL PREPARATION:

6.1 To an open, 1 qt (1 L) wide-mouth glass jar, add 500 g of MIL-L-23699 lubricating oil and 50 g of carbon black.

6.2 Place the jar in an oven at 240 °C ± 5 (464 °F ± 9) and insert the glass tube through the top of the oven, resting it centered on the bottom of the jar.

6.3 Bubble clean, dry air up through the mixture at a rate of 0.018 ft^3/min ± 0.001 (8.5 mL/s ± 0.5).

6.4 Bake with aeration for 120 h ± 0.5, remove the glass tube; remove the jar from the oven and allow the mixture to cool to room temperature.

6.5 Before applying to test panels, the soil shall be mixed until homogeneous.

7. TEST PANEL PREPARATION:

The test panel shall be wiped clean with absorbent tissue wet with toluene, allowed to dry, abraded with a flap brush to obtain a uniform surface, wiped with toluene, and wiped with isopropanol. The test panel shall then be heated in an oven at 230 °C ± 5 (446 °F ± 9) for 5 min, cooled to room temperature, and weighed to the nearest 0.1 mg. The weight shall be recorded as "C".

8. SOIL APPLICATION:

8.1 Approximately 240 mg of soil shall be applied using the stiff bristle brush to obtain a uniform coating within the scribed circle.

8.2 The soiled panel shall be baked at 230 °C ± 5 (446 °F ± 9) for 20 min ± 0.2, cooled to room temperature, and weighed to the nearest 0.1 mg. The weight shall be recorded as "A".

8.2.1 Only test panels with 135 to 165 mg, inclusive, of soil shall be used in the cleaning efficiency test.