Designation: F302 – 09 (Reapproved 2021)

Standard Practice for Field Sampling of Aerospace Fluids in Containers[1]

This standard is issued under the fixed designation F302; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers field sampling of fluids from hermetically sealed containers and other fluid containers of 208-L volume maximum. It may be utilized at manufacturing, storage, or use levels for obtaining representative fluid samples for chemical, physical, or particulate matter determinations.

1.2 Use of this practice depends upon variables such as fluid toxicity, restrictive fluid odors, fluid flammability, and so forth. It is suitable for most hydraulic fluids; however, care should be exercised in determining compatibility before use.[2]

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* For hazard statement, see 6.5.1.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D1193 Specification for Reagent Water

D1836 Specification for Commercial Hexanes

D2021 Specification for Neutral Detergent, 40 Percent Alkylbenzene Sulfonate Type (Withdrawn 2000)[4]

D4898 Test Method for Insoluble Contamination of Hydraulic Fluids by Gravimetric Analysis

F311 Practice for Processing Aerospace Liquid Samples for Particulate Contamination Analysis Using Membrane Filters

F314 Methods of Test for Identification of Metallic and Fibrous Contaminants in Aerospace Fluids (Withdrawn 1990)[4]

3. Summary of Practice

3.1 The minimum requirements for container agitation, sample withdrawal, and sample transfer are given in this practice. Precautions to ensure sampling reliability are included in the procedure to the extent required by normal processing conditions. The procedure involves agitating the container, withdrawing with a suitable instrument capable of creating a vacuum, a predetermined quantity of fluid, and immediately transferring it to a vessel, properly identified, to hold for analysis by a stipulated method.

4. Significance and Use

4.1 Samples obtained by use of this practice are intended for processing in accordance with Practice F311, Test Method D4898, and Test Method F314, and other chemical or physical methods of analysis.

5. Apparatus

5.1 *Pipet,* volumetric transfer or equivalent rubber-bulb type. A taper-jointed type, as shown in Fig. 1, 560 mm long, calibrated to deliver 100 mL at 20°C, is also acceptable. This type provides for ease of maintenance by being separable at the midpoint of the bulb.

NOTE 1—The volume capacities selected for the pipet and sample bottles shall be as required for the sample volume desired. Normally a 100 ± 5-mL sample is standard, which would require a capacity of approximately 125 mL. Unless otherwise indicated, it is intended that a sample volume of 100 ± 5 mL be used for accomplishing the methods defined herein.

5.2 *Bottles,* sample, wide-mouth type (Note 1).

[1] This practice is under the jurisdiction of ASTM Committee E21 on Space Simulation and Applications of Space Technology and is the direct responsibility of Subcommittee E21.05 on Contamination.

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[2] Where a special environment is required, a Proposed Laboratory Method for Sampling Aerospace Fluids in Containers is under development in the committee. For further information write to B. R. Hall, American Petroleum Institute, 1220 L St., N.W., Washington, D. C. 20005.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[4] The last approved version of this historical standard is referenced on www.astm.org.

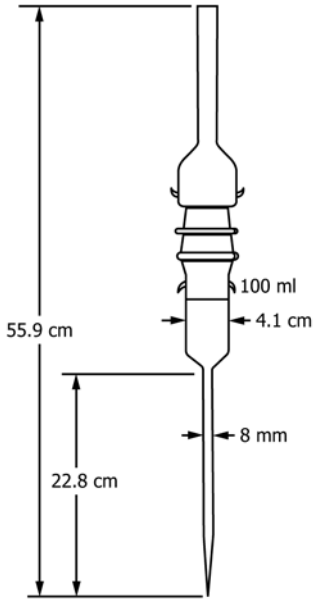

FIG. 1 Separable Pipet

5.3 *Solvent Filtering Dispenser*—An apparatus to dispense a stream of 2.0 µm or finer membrane-filtered fluid.

5.4 *Vinylidene Chloride, Polyethylene Terephthalate, or Polyamide Sheet,* 0.1 mm (4-mil) min.

5.5 *Beverage Can Opener* (*Unplated*), sharpened, deburred.

6. Reagents

6.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.[5] Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

6.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to Specification D1193.

6.3 *Detergent,* free-rinsing. Material conforming to Specification D2021 is suitable.

6.4 *Isopropyl Alcohol,* acetone-free.[6]

6.5 *Ligroine* (*Petroleum Ether*), 30 to 60°C.

6.5.1 **Warning**—Ligroine and hexane are highly flammable and should be handled with adequate precautions.

NOTE 2—Ligroine is suggested because of its high-evaporation rate and relatively negligible residue (0.001 %). Other solvents are acceptable as required by the sampling activity, when a comparable evaporation and residue is considered, such as commercial hexanes (see Specification D1836). In any case, reagent selected should not have a harmful effect on the sampling apparatus, sampled fluid, or the equipment to be used in processing the sample, or both.

7. Preparations of Apparatus and Reagents

7.1 Apparatus used in this practice shall be prepared by a reliable process for assurance of essentially contamination-free surfaces.

NOTE 3—It is recommended that a process shall be used as described in Test Method D4898 or Practice F311.

7.2 Reagents used in this practice shall be suitably filtered and stored to maintain a level of refinement equivalent to the highest attainable as required by the product evaluation method of determination.

8. Procedure

8.1 Select at random representative containers of fluid to be sampled. When defined, selection shall be as required by the test method. A suggested cube-root sampling quantity is shown in Table 1. Alternative plans may be based on the past experience and judgment of the sampling activity. Quantities exceeding those given in Table 1 should be determined by the cube-root method.

8.2 Having selected the containers to be sampled, prepare and sample each one individually.

8.3 Agitate the fluid container as required to assure safety and completeness of sampling of the particulate matter. The method used shall depend on the height of the container, the fluid viscosity, and the particle size, as related in Fig. 2. First, the container shall be inverted for a period of time sufficient for the particles of the predominant size to fall half the height of the container. This time shall be determined as follows: the fluid viscosity at the temperature of sampling shall be estimated and an appropriate diagonal line on Fig. 2 selected. The predominant particle size will probably be known from past experience; if not, 20 µm may be used as a preliminary estimate. The settling time shall then be read from Fig. 2 for a 1-L container, and the size factor applied if necessary. Any situation not covered by the chart may be calculated from Stokes' law. The time may turn out to be burdensome in some special cases; warming the container would be permissible in such cases provided it will not cause solution of plastic, etc., which might change the particle count. After the inversion period, the container shall be placed on its side and rolled slowly five turns. It shall then be rolled in the opposite direction for five turns and returned to an upright position. The

TABLE 1 Sample Plan

Quantity of Containers	Sample
1 to 10	1
11 to 30	3
31 to 70	4
71 to 150	5
151 to 210	6
210 to 530	8
531 to 1170	10

[5] *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For Suggestions on the testing of reagents not listed by the American Chemical Society, see *Annual Standards for Laboratory Chemicals,* BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary,* U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.

[6] Material conforming to USP XVII, p. 995, is suitable.