

Aircraft Flushing Fluid:

An Economical New Cleaner for Tough Hydrocarbon Soils

Select the ACF2 Degreaser for Reliable Results in Critical Degreasing Applications

The *Aircraft Flushing Fluid II* from Micro Care is an excellent example of today's new, ozone-safe cleaning technology. This cleaner delivers speedy cleaning, easy handling and superior environmental traits in an affordable, nonflammable solvent package.

Technical Summary

Micro Care's *Aircraft Flushing Fluid II* (#MCC-ACF2) is a proprietary azeotrope of "Vertrel® C" hydrofluorocarbons. The three main ingredients are 2,3-dihydrodecafluoropentane, 1,1,1,3,3 penta-fluorobutane and trans-1,2-dichloro-ethylene.

This product is designed as a replacement for all of the old-style, ozone-depleting, fluorinated cleaners. As such, it features easy handling and broad materials compatibility. This cleaner is targeted specifically at hydraulic fluids from the surfaces of military aircraft. It also is suitable for cleaning tough hydrocarbon residues in a heated vapor degreaser systems. The cleaner is safe on most common components, substrates, ceramics, metals and manufacturing materials, except as noted in this Specification.

ACF2 from Micro Care has "zero" ozone depletion potential and low global warming potential. It can replace CFC-113, 1,1,1-trichloroethane (1,1,1-TCA), HCFCs and PFCs in many applications. All the components of this product are accepted under the USA EPA's "Significant New Alternatives Policy" (SNAP)

Engineers will appreciate that this cleaner requires very few technical compromises. It delivers superior cleaning with the easy handling and storage of nonflammable solvents. It dries quickly and has very acceptable toxicity ratings with a negligible aroma. It is packaged in almost any dispensing technology the application requires. *Aircraft*



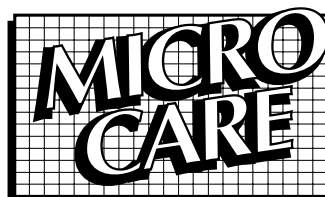
Every day ACF2 is used on the hydraulic systems of U.S. military aircraft.

Flushing Fluid II from Micro Care is a proven technology for many critical cleaning applications.

Product Summary...

- Proven Cleaning on Tough Soils
- Nonflammable for Easy Handling
- Fast Drying, No Rinsing
- No Odor
- An Excellent Replacement for Old-Style Ozone-Depleting Solvents

Available World-Wide from...



The World's Cleaning Experts

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Select ACF2 for Those Tough Cleaning Applications

Table 1

Plastic Compatibility^a

Compatible:

Polyethylene Acetal Polyester, PET, PBT Epoxy Polyimide, PI, PEI, PAI Liquid Crystal Polymer Polyetherketone, PEK Phenolic Polyaryletherketone, PEEK PTFE, ETFE Polyarylsulfone, PAS Polypropylene Polyphenylene Sulfide, PPS Polyvinylchloride Polysulfone, PSO Chlorinated PVC Ionomer

Incompatible:^b

Polystyrene, ABS, Polyphenylene Oxide, PPO, Acrylic Cellulose

Notes: (a) Test: 15 minutes immersion at room temperature. (b) Material composition varies depending upon compounding agents, plasticizers, processing, etc. Specific materials should be tested for compatibility with solvent.

Applications

The ACF2 solvent was formulated for a variety of cleaning applications. First, it can be used at room temperature to flush either synthetic or organic hydraulic fluid from metal, ceramics, glass and durable plastic surfaces. In field tests, ACF2 easily rinsed Skydrol[®] hydraulic fluid from test panels typical of military aircraft systems, such as landing gear, wings, flaps and tools. Subsequently, the product was specified for use on certain U.S. military aircraft. Tests on commercial aircraft systems were equally successful.

In addition, this fluid excels as a vapor degreasing solvent. It offers superior solvency for hydraulic oils, lubricating oils, cutting oils, penetrating oils and even heavy greases. It is one of the most economical solvents available with this combination of properties.

If desired, this solvent could be available in aerosol form. For example, a very similar (but not identical) formulation, SuprClean[™], is available in aerosol cans from Micro Care. HFC-134a is the optimal propellant as it preserves the nonflammable characteristics of the solvent azeotrope.

Micro Care can modify the packaging of the ACF2 solvent to meet a customer's unique requirements; often specific safety, transportation or procurement details are required. Contact Micro Care for details on private labeling capabilities.

For insights on the use of this solvent in a vapor degreaser, review the technical data, presentations and spreadsheets available at www.VertrelSolvents.com

Materials Compatibility

This is an active degreasing solvent. It is designed for environments in which soft plastics will rarely be found. The ACF2 solvent is compatible with zinc, stainless steel, aluminum, titanium, copper and brass; glass; and most sealants, elastomers and durable plastics.

Most electronic components can be cleaned in this solvent. However, acrylic, ABS and polycarbonate parts — particularly if stressed — may show slight cracking or crazing damage after prolonged or repeated exposures. Testing of such components is highly recommended.

Some elastomers may swell or shrink after prolonged exposures. These parts will, in most cases, revert to within a few percent of original size after air drying. Swell, shrinkage and extractables are sensitive to the compounding agents and processes used in the manufacture of the elastomers; test before deployment.

Table 2

Elastomer Compatibility^a

Compatible:

Buna-N, NBR, Nitrile Buna S^c, SBR, GRS, Butyl Rubber^c, IIR Chlorosulfonated PE, EPM, EPDM^c, Nordel[®] Polysulfide, Natural Rubber, Isoprene Neoprene, Urethane Viton[®] B, Silicone

Incompatible:^b

None Tested

Notes: (a) Test: 15 minutes immersion at room temperature. (b) Material composition varies depending upon compounding agents, plasticizers, processing, etc. Specific materials should be tested for compatibility with solvent. (c) Recommended for elastomeric applications

This cleaner found acceptable for the cured and partially-cured urethane paints that were tested on typical military aircraft assemblies, but it could affect the exposed CIC coatings used on commercial aircraft.

As always, thorough testing prior to deployment is vital.

Micro Care and the DuPont labs both can assist customers with materials compatibility testing of their components. Contact Micro Care directly for additional information.

Table 3

ACF2 Exposure Limits

Material	Rating	Notes
Vertrel® XF:	8-Hour TWA AEL 200 ppm	a
	12-Hour TWA AEL 400 ppm ceiling	b
HFC-365mfc:	8-Hour TWA AEL 200 ppm	a
Trans-1,2-dichloroethylene:	8-Hour TWA TLV 200	c
	Combined ACF2 Azeotropic Mix:	
	8-Hour TWA AEL 260 (Calc.)	a, b, d

Notes: (a) The Acceptable Exposure Limit ("AEL") is an airborne inhalation exposure limit established by DuPont that specifies time-weighted average concentrations to which workers may be repeatedly exposed without adverse effects. (b) A ceiling limit is the contraction of vapors that should not be exceeded during any part of the working day. The ceiling limit for individual components applies to the blended product as well. (c) The Threshold Limit Value ("TLV") is an air-borne inhalation exposure limit established by the American Conference of Government and Industrial Hygienists (ACGIH). It specifies time-weighted average concentrations to which workers may be repeatedly exposed without adverse effects. (d) Calculated in accordance with ACGIH formula for computing TLVs of mixtures.

Worker Safety Issues

Data from toxicity studies have demonstrated that the ACF2 solvent has low toxicity and is safe when handled in accordance with the recommended procedures.

In general, the material has low acute inhalation toxicity and, when properly handled, worker exposures are maintained well below recommended exposure limits. However, the cleaner is a skin and eye irritant so the normal precautions should be implemented.

The ACF2 solvent exhibits no flash point when tested using the Pensky-Martens Closed Cup Tester (ASTMD93). It is not classified as a flammable liquid by NFPA or DOT. The product exhibits vapor flammability limits in air, and has the potential to ignite in open air if an ignition source is present. However, laboratory tests show the solvent will not sustain combustion and quickly self-extinguishes.

Employee training is essential with any industrial solvent and this product is no exception. Extreme mis-use may produce very severe health effects. For the most current health and safety information, check the Material Safety Data Sheet.

Review **Table 3** for the applicable exposure limits for the component materials of this solvent. **Table 4** includes flammability data. It is essential that users of this (or any) industrial chemical must read and understand the Material Safety Data Sheet (MSDS), available on-line at www.VertrelSolvents.com.

ACF2 is thermally stable and does not oxidize or degrade during storage. It should be stored in a clean, dry area and protected from temperature extremes. Do not allow stored product to exceed 52°C (125°F) to prevent leakage or potential rupture of container from pressure and expansion.

The ACF2 vapors are heavier than air. In the event of a large leak or spill, vapors may concentrate near the floor and displace the oxygen available for breathing, causing suffocation. Evacuate the area and do not re-enter until the vapor concentration falls below the AEL.

The solvent is easily recovered using common industrial processes because the material demonstrates azeotropic-like behavior at its boiling point. This means the ACF2 solvent can be recycled and reused in a conventional still or vapor degreaser.

Review the information available at www.VertrelSolvents.com regarding solvent handling techniques to reduce solvent emissions as well as the Frequently Asked Questions on handling, storage, the use of drum pumps and vapor monitoring.

Environmental

The ACF2 solvent has "zero" ozone depletion potential and a low global warming potential (Table 4). It is an excellent alternative to CFC-113, methylchloroform, HCFCs and PFCs in many critical applications where reliability is paramount. The constituents chemicals used in this solvent are accepted by the U.S. Environmental Protection Agency under the "Significant New Alternatives Policy" (SNAP) program as a substitute for ozone-depleting substances. One component, HFC-43-10mee, is subject to the "Significant New Use Rule" (SNUR) and should be used only in the indicated applications.

The components of the ACF2 solvent are listed in the TSCA inventory. None of those components are included in the SARA Title III Section 313 list of toxic chemicals, and none are subject to SARA Title III (EPCRA) reporting requirements.

TRADEMARKS: "Micro Care" and the Micro Care logo are registered trademarks of Micro Care Corp. "SuprClean" is a trademark of Micro Care. The Trigger Grip system is protected under various U.S. patents. "Vertrel" is a registered trademark of Dupont Corp. The Vertrel products are protected by patents in the U.S. and elsewhere.

Table 4

Aircraft Flushing Fluid II

Selected Technical Data

General Data

Primary Use	Degreaser and Flushing Solvent
Appearance	Crystal Clear Liquid
Odor	Almost None
Stability Over Temperature	Azeotropic
Boiling Point / Freezing Point	41°C / 106°F / -20°C / 10°F

Solvency & Cleaning Data

Molecular Weight	135
Specific Gravity	1.30 @ 25°C (10.8 lb./gal.)
Nonvolatile Residues, Typical	<10 ppm by wt ^a
Viscosity, cPs	0.56
Surface Tension	16.9 dynes/cm
Water Solubility	0.3%
Water Content	<200 ppm max.
pH	Neutral
Vapor Pressure	49.6 mm Hg / 9.6 psia
Vapor Density (Air = 1)	4.3
Heat of Vaporization at Boiling Point	48 cal/g
Heat Capacity	0.31 cal/g°C / 0.31 Btu/lb°F
Evaporation Rate (Ether = 1)	>1
Dielectric	Conductive

Health, Safety & Environmental Data

Flashpoint (TCC)/Rating	None / Nonflammable ^b
Vapor Flammability in Air, vol%	Lower Limit: 6.5%
	Upper Limit: 11.0%
Exposure Limits (Calc.)	269 ppm
TSCA Listed	Yes
NFPA Ratings: (Health/Flammability/Reactivity)	1,0,0
Ozone-Depletion Potential	Zero (Ozone-Safe)
Non-Exempt Organic Content	589 g/l
Global Warming Potential (GWP)	990

Packaging and Other Notes

SHIPPING: The ACF2 solvent is available commercially in the following packaging:

MCC-ACF2D	500 lb. (227 kg) drums	55 gal. (208 L)*
MCC-ACF2P	50 lb. (22.7 kg) pails	5 gal. (19 L)*
MCC-ACF2G	10 lb. (4.5 kg) minipail	1 gal. (3.8 L)*
MCC-ACF2GG	10 lb. (4.5 kg) glass bottle	1 gal. (3.8 L)*
MCC-ACF2GG	10 lb. (4.5 kg) glass bottle	1 gal. (3.8 L)*
MCC-ACF2L †	3 lb. (1.3 kg) metal bottle	1 quart (1 L)*

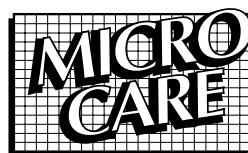
NOTES: ^a For material packaged in drums. For pails, the NVR standard is 50 ppm. ^b Pensky-Martens Closed Cup Tester (ASTM D 93). * These materials are packaged by weight, not by volume, in metal drums and pails. Liquid volumes are published only as a convenient general reference. † Sample package only.

DISCLAIMER: Micro Care publishes this information from sources believed to be accurate. This data is intended for persons having the technical skills to evaluate and use the data properly. Micro Care does not guarantee the accuracy of the data and assumes no liability in connection with damages incurred using it. Micro Care's liability is limited to the replacement of this product. Specifications are subject to change without notice.

Availability

Distributed Locally by:

Manufactured by



The World's Cleaning Experts

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Aircraft Flushing Fluid II from Micro Care is often used for degreasing, such as removing hydraulic fluids from military aircraft surfaces. The solvent removes the oils without damaging even recently-painted surfaces.