Product Safety Assessment

**UCAR™ Propylene Glycol Aircraft Deicing & Anti-Icing Fluids**

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**Names**

- CAS No. 57-55-6 [Propylene glycol (PG)]
- PG Type I Aircraft Deicing Fluid (ADF)
- UCAR™ PG ADF Concentrate
- UCAR PG ADF Dilute “55/45”
- UCAR FlightGuard™ AD-49 anti-icing fluid
- PG Type IV Aircraft Anti-icing Fluid (AAF)
- SAE AMS 1428 PG-based Type IV aircraft anti-icing fluid
- SAE AMS 1424 PG-based Type I aircraft deicing fluid

**Product Overview**

- Dow manufactures propylene glycol (PG)-based aircraft deicing fluids (ADF) under the trade name UCAR™ PG ADF and a PG-based aircraft anti-icing fluid (AAF) under the trade name UCAR FlightGuard™ AD-49 PG AAF. These products conform to industry standards set by the Society of Automotive Engineers (SAE) International, including Aerospace Material Specification (AMS) 1424 and AMS 1428. For further details, see **Product Description**.
- ADFs are commercial products used exclusively for the removal of snow, ice, and frost from the exterior surfaces of aircraft. AAF is typically applied following aircraft deicing or during active precipitation to prevent additional snow or ice build-up over an extended period of time. AAF can also be used as a preventive by applying to dry aircraft when overnight frost is forecast. For further details, see **Product Uses**.
- Eye contact with these fluids may cause slight, temporary irritation, although corneal injury is unlikely. Prolonged skin contact is essentially nonirritating. Repeated contact may cause flaking and softening of the skin. At room temperature, exposure to vapor is minimal; however, vapor from heated material may cause respiratory irritation and other effects. For further details, see **Health Information**.
- Worker exposure is possible during product formulation or during aircraft deicing or anti-icing operations. These fluids are commercial-grade products and are not available for home use. For further details, see **Exposure Potential**.
- These products are thermally stable at typical storage and use temperatures. Some components of these products can decompose at elevated temperatures, causing pressure build-up in closed systems. Avoid contact with strong acids, strong bases, and strong oxidizers. Areas sprayed with these fluids (such as the tarmac) may become slippery. For further details, see **Physical Hazard Information**.

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Manufacture of Product

- **Capacity** – Dow is a large producer of propylene glycol (PG). Dow has production facilities in the United States, Germany, Brazil, and Australia. Total world consumption of PG in 2003 was estimated at 1.2 million metric tons (2.6 billion pounds).\(^6\)
- **Process** – Most commercial production of propylene glycol is by non-catalytic hydrolysis of propylene oxide using high temperature and high pressure. These products are formulated with propylene glycol as the main ingredient. Water, corrosion inhibitors, wetting agents, and dyes are added to provide the desired combination of properties for the end use of the product. Thickeners are also added to the Type IV aircraft anti-icing fluid (AAF).

Product Description\(^2,4,7\)

The primary ingredient in these products is propylene glycol (PG). PG is a colorless, odorless liquid. For further information about PG, refer to the [Propylene Glycol Product Safety Assessment] or the relevant Safety Data Sheet.

Dow manufactures two PG-based aircraft deicing fluids: UCAR™ PG ADF Concentrate and UCAR PG ADF Dilute “55/45”. These formulations are orange liquids with a sweet odor and conform to all technical requirements of SAE AMS 1424 for SAE Type I aircraft deicing/anti-icing fluids, as well as specifications from aircraft manufacturers Douglas and Boeing. In addition to propylene glycol, they contain water, corrosion inhibitors, wetting agents, and orange dye. UCAR PG ADF Concentrate contains approximately 88% PG and must be diluted prior to use. UCAR PG ADF Dilute “55/45” is a ready-to-use fluid with a freezing point of about –36°C (–32.8°F).

Dow’s anti-icing fluid, UCAR™ FlightGuard™ AD-49 AAF, is a green liquid with a mild, sweet odor that conforms to all technical requirements of SAE AMS 1428 for SAE Type IV aircraft deicing/anti-icing fluids. This product contains PG, water, corrosion inhibitors, wetting agents, thickeners, and green dye. Undiluted UCAR FlightGuard AD-49 AAF has a freezing point of about –36°C (–33°F).

Product Uses\(^9,10,11,12\)

**Aircraft Deicing fluids (ADF)** – ADFs are used for removal of snow, ice, and frost from the exterior surfaces of aircraft. ADFs are normally applied hot and sprayed directly onto aircraft surfaces, especially wings and other control surfaces, immediately preceding takeoff.

**Anti-icing fluid (AAF)** – During periods of active precipitation (snow, sleet, freezing rain) AAF is applied following the ADF operation. In addition to deicing functionality, it provides protection against the build-up of new snow or ice. It is designed to coat the aircraft exterior as a thick film, absorbing snow or freezing rain. It prevents absorbed precipitation from refreezing and also absorbs residual ADF from prior deicing. During takeoff, the AAF flows off the aircraft exterior. AAF can also be applied to dry aircraft as a preventive if overnight frost is expected.
Exposure Potential

Based on the uses for ADF and AAF products, the public could be exposed through:

- **Workplace exposure** – Exposure can occur at a manufacturing site. Those working with these products in production facilities could be exposed during maintenance, sampling, testing, or other procedures. Airfield personnel can be exposed during aircraft deicing and anti-icing operations. The potential for exposure is reduced by engineering controls and personal protective equipment. Facilities that manufacture or use these fluids should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit exposure. See [Health Information](#).

- **Consumer exposure to ADF and AAF products** – Dow does not sell these products for consumer use. Under normal conditions of use, airline passengers and flight crews would not be expected to have any significant exposure to these fluids. Any odor detected would be at an exposure level that is considered safe for humans. See [Health Information](#).

- **Environmental releases** – In the event of a spill, the focus is on containing the spill to prevent contamination of soil, ditches, sewers, waterways, or groundwater. For small spills, absorb the material with materials such as cat litter, sawdust, vermiculite, or Zorball. Collect the material in suitable and properly labeled containers. See [Environmental, Health, and Physical Hazard Information](#).

- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, dike the area to contain the spill. Isolate the area and evacuate unnecessary personnel. Recover spilled material if possible. Use appropriate safety equipment. Excessive product accumulation on the tarmac during deicing or anti-icing operations should be removed by mechanical means (e.g., vacuum truck). See [Environmental and Physical Hazard Information](#).

- **In case of fire** – Keep people away and deny unnecessary entry. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing or fight the fire from a safe distance. Use water fog or fine spray, dry-chemical or carbon-dioxide fire extinguishers, or foam. Do not use a direct water stream as it may spread the fire. Follow emergency procedures carefully. See [Health and Physical Hazard Information](#).

For more information, see the relevant [Safety Data Sheet](#).

Health Information

The primary ingredient in UCAR™ PG ADF and UCAR FlightGuard™ AAF products is propylene glycol (PG), which is “generally recognized as safe” (GRAS) as a food additive by the U.S. Food and Drug Administration (FDA). For more information about PG, refer to the [Propylene Glycol Product Safety Assessment](#) and the relevant [Safety Data Sheet](#).

**Eye and Skin Contact** – Eye contact with these ADF and AAF products may cause slight, temporary irritation but is unlikely to result in corneal injury. Prolonged skin contact is essentially nonirritating and is unlikely to result in absorption of harmful amounts. Repeated contact may cause flaking and softening of the skin. Contact with heated fluids may cause thermal burns.

**Inhalation** – At room temperature, exposure to vapor is minimal. Excessive inhalation of heated vapors or mist may cause respiratory irritation or other effects.

**Ingestion** – These products have very low toxicity if swallowed. Harmful effects are not anticipated from swallowing small amounts.

**Cancer and Birth Defect Information** – Similar formulations did not cause cancer in laboratory animals and were not genotoxic or mutagenic in both in vitro and in vivo tests. The major

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component in these products did not cause birth defects or any other fetal effects, and also did not adversely affect reproduction or fertility in laboratory animals.

For more information, see the relevant Safety Data Sheet.

**Environmental Information**

Propylene glycol, the primary component in these ADF and AAF products, has a low bioconcentration potential (tendency to accumulate in the food chain) and is readily biodegradable. This family of materials is practically nontoxic to fish and other aquatic organisms on an acute basis (large, single exposure). For more information about PG, refer to the Propylene Glycol Product Safety Assessment.

For more information, see the relevant Safety Data Sheet.

**Physical Hazard Information**

UCAR™ PG ADF and UCAR FlightGuard™ AAF products are thermally stable at typical storage and use temperatures. Some components of these products can decompose at elevated temperatures causing pressure build-up in closed systems. Exposure to sunlight will cause the color in these products to fade. Avoid contact with strong acids, strong bases, and strong oxidizers. Areas sprayed with these fluids (such as the tarmac) may become slippery.

For more information, see the relevant Safety Data Sheet.

**Regulatory Information**

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of these ADF and AAF products. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant Safety Data Sheet, Product Information Bulletin, or Contact Us.

**Additional Information**

- Safety Data Sheet (http://www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (http://www.dow.com/aircraft/contact/index.htm)

**Trademark**

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- “Thickeners for Aircraft Anti-icing Fluids: Relationship to Performance Properties,”
  Presentation, The Dow Chemical Company


References

4 UCAR PG Aircraft Deicing Fluid Concentrate Material Safety Data Sheet, The Dow Chemical Company
12 Estimates by The Dow Chemical Company.

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NOTICES:¹

As part of its 2015 Sustainability Goals, Dow has committed to make publicly available safety assessments for its products globally. This product safety assessment is intended to give general information about the chemical (or categories of chemicals) addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the relevant Safety Data Sheet, which should be consulted before use of the chemical. This product safety assessment does not replace required communication documents such as the Safety Data Sheet.

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