### Heptafluoropropane (HFC-227ea)
(Pressurized with Nitrogen)

This document does not contain any US export controlled technical data.

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<td>P. ANDERSON</td>
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1. IDENTIFICATION

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Heptafluoropropane (HFC-227ea) (Pressurized with Nitrogen)</th>
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<tbody>
<tr>
<td>Other Names</td>
<td>FM-200®</td>
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<tr>
<td>Recommended use of the chemical and restrictions on use</td>
<td>Fire Extinguishing Agent</td>
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<tr>
<td>Identified uses</td>
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<tr>
<td>Restrictions on Use</td>
<td>Consult applicable fire protection codes</td>
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<tr>
<td>Company Identification</td>
<td>UTC Aerospace Systems</td>
</tr>
<tr>
<td>Customer Information Number</td>
<td>(253) 237-7004</td>
</tr>
<tr>
<td>Emergency Telephone Number</td>
<td>1-800-451-8386 Site Code: 33067</td>
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<tr>
<td>Issue Date</td>
<td>July 2, 2015</td>
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<tr>
<td>Supersedes Date</td>
<td>Rev. A, July 10, 2013</td>
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Safety Data Sheet prepared in accordance with OSHA’s Hazard Communication Standard (29 CFR 1910.1200) and the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

2. HAZARD IDENTIFICATION

Hazard Classification
- Gas under pressure – Liquefied gas
- Simple asphyxiant

Label Elements
- Hazard Symbols
- Signal Word: Warning

Hazard Statements
- Contents under pressure; may explode if heated.
- May displace oxygen and cause rapid suffocation.

Precautionary Statements
- Prevention
  - Do not enter confined space unless adequately ventilated.
  - In case of inadequate ventilation wear respiratory protection.
- Response
  - None
2. HAZARD IDENTIFICATION

Storage
Protect from sunlight and store in well-ventilated place.
Keep container tightly closed.

Disposal
None

Other Hazards
Direct contact with the cold gas or liquid can cause freezing of exposed tissues. Exposure to vapor at high concentrations can cause cardiac sensitization and suffocation if air is displaced by vapors.

Specific Concentration Limits
The values listed below represent the percentages of ingredients of unknown toxicity.

- Acute oral toxicity: 0%
- Acute dermal toxicity: 0%
- Acute inhalation toxicity: 0%
- Acute aquatic toxicity: 0%

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms: Heptafluoropropane, HFC-227ea, FM-200®
This product is a substance.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS Number</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1,1,2,3,3,3-Heptafluoropropane</td>
<td>431-89-0</td>
<td>&gt;99.9%</td>
</tr>
</tbody>
</table>

Note: This product uses nitrogen as the expellant and also contains a small amount of helium.

4. FIRST-AID MEASURES

Description of necessary first-aid measures

Eyes
Immediately flood the eye with plenty of water for at least 15 minutes, holding the eye open. Obtain medical attention if soreness or redness persists.

Skin
Flush with water. Obtain medical attention if frostbite or blistering occurs or redness persists.

Ingestion
Ingestion is not considered a potential route of exposure.

Inhalation
Remove from exposure. If there is difficulty in breathing, give oxygen. Obtain medical attention immediately.

Most important symptoms/effects, acute and delayed
Aside from the information found under Description of necessary first aid measures (above) and Indication of immediate medical attention and special treatment needed, no additional symptoms and effects are anticipated.
4. FIRST-AID MEASURES

Indication of immediate medical attention and special treatment needed

Notes to Physicians
In case of frostbite, place the frostbitten part in warm water. If warm water is not available or impractical to use, wrap the affected parts gently in blankets. DO NOT USE HOT WATER. The use of epinephrine or similar compounds can increase susceptibility to heart irregularities caused by excessive exposure to these types of compounds.

5. FIRE - FIGHTING MEASURES

Suitable Extinguishing Media
This preparation is used as an extinguishing agent and therefore is not a problem when trying to control a fire. Use extinguishing agent appropriate to other materials involved. Keep pressurized containers and surroundings cool with water spray as they may rupture or burst in the heat of a fire.

Specific hazards arising from the chemical
Pressurized containers may explode in heat of fire.

Special Protective Actions for Fire-Fighters
Wear full protective clothing and self-contained breathing apparatus as appropriate for specific fire conditions.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures
Wear full protective clothing and self-contained breathing apparatus. Remove leaking cylinder to a safe place. Ventilate the area. Leaks inside confined spaces may cause suffocation as vapors may displace air, and should not be entered without a self-contained breathing apparatus.

Environmental Precautions
Prevent the material from being released into the environment.

Methods and materials for containment and cleaning up
Material evaporates.

7. HANDLING AND STORAGE

Precautions for safe handling
Wear appropriate protective clothing. Prevent skin and eye contact.

Conditions for safe storage
Pressurized containers should be properly stored and secured to prevent falling or being knocked over. Do not drag, slide or roll pressurized containers. Do not drop pressurized containers or permit them to strike against each other. Never apply flame or localized heat directly to any part of the pressurized or plastic container. Store pressurized and plastic containers away from high heat sources. Storage area should be: cool - dry - well ventilated - under cover - out of direct sunlight.
8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters
Exposure limits are listed below, if they exist.

1,1,1,2,3,3,3-Heptafluoropropane
None assigned.

Appropriate engineering controls
Use with adequate ventilation. There should be local procedures for the selection, training, inspection and maintenance of this equipment. When used in large volumes, use local exhaust ventilation.

Individual protection measures
Respiratory Protection
In oxygen deficient atmospheres, use a self-contained breathing apparatus, as an air purifying respirator will not provide protection.
Skin Protection
Rubber gloves.
Eye/Face Protection
Chemical goggles or safety glasses with side shields.
Body Protection
Normal work wear.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Agent</th>
<th>Appearance</th>
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<tbody>
<tr>
<td></td>
<td>Liquefied gas under pressure</td>
</tr>
<tr>
<td>Physical State</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td>Colorless</td>
</tr>
<tr>
<td>Color</td>
<td>Odor</td>
</tr>
<tr>
<td></td>
<td>Slight ether like</td>
</tr>
<tr>
<td>Odor</td>
<td>Odor Threshold</td>
</tr>
<tr>
<td></td>
<td>No data available</td>
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<tr>
<td>pH</td>
<td>Specific Gravity</td>
</tr>
<tr>
<td></td>
<td>1.46</td>
</tr>
<tr>
<td>Boiling Range/Point (°C/F)</td>
<td>Melting Point (°C/F)</td>
</tr>
<tr>
<td>-16.4°C/3 °F</td>
<td>-129.5°C/265 °F</td>
</tr>
<tr>
<td>Flash Point (PMCC) (°C/F)</td>
<td>Not flammable</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>Evaporation Rate (BuAc=1)</td>
</tr>
<tr>
<td>540 hPa at -30 °C</td>
<td>Not applicable</td>
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<tr>
<td>29,360 hPa at 123 °C</td>
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<tr>
<td>Solubility in Water</td>
<td>Vapor Density (Air = 1)</td>
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<tr>
<td>0.23 g/l at 25°C</td>
<td>5.8</td>
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<tr>
<td>VOC (%)</td>
<td>Partition coefficient (n-octanol/water)</td>
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<td>Not applicable</td>
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<tr>
<td>Viscosity</td>
<td>Auto-ignition Temperature</td>
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<tr>
<td>Not applicable</td>
<td>No data available</td>
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<tr>
<td>Decomposition Temperature</td>
<td>No data available</td>
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</table>
9. PHYSICAL AND CHEMICAL PROPERTIES

**Expellant**
- **Appearance**: Compressed gas
- **Physical State**: Compressed gas
- **Color**: Colorless
- **Odor**: None
- **Odor Threshold**: No data available
- **pH**: Not applicable
- **Specific Gravity**: 1.251 g/l (Nitrogen)
  - 0.1786 g/l (Helium)
- **Boiling Range/Point (°C/F)**: -196 °C/-321 °F (Nitrogen)
  - -268.9 °C/-452.0 °F (Helium)
- **Melting Point (°C/F)**: -210 °C/-346 °F (Nitrogen)
  - -272.2 °C/-452.0 °F (Helium)
- **Flash Point (PMCC) (°C/F)**: Not flammable
- **Vapor Pressure**: No data available
- **Evaporation Rate (BuAc=1)**: No data available
- **Solubility in Water**: No data available
- **Vapor Density (Air = 1)**: Not applicable
- **VOC (g/l)**: None
- **VOC (%)**: None
- **Partition coefficient (n-octanol/water)**: No data available
- **Viscosity**: Not applicable
- **Auto-ignition Temperature**: No data available
- **Decomposition Temperature**: No data available
- **Upper explosive limit**: Not explosive
- **Lower explosive limit**: Not explosive
- **Flammability (solid, gas)**: Not flammable

10. STABILITY AND REACTIVITY

**Reactivity**
Decomposes on heating. Containers may rupture or explode if exposed to heat.

**Chemical Stability**
Stable under normal conditions.

**Possibility of hazardous reactions**
Hazardous polymerization will not occur.

**Conditions to Avoid**
Heat - High temperatures - Exposure to direct sunlight

**Incompatible Materials**
Powdered metals (ex. aluminum, zinc, etc.) - strong oxidizing agents – strong reducing agents – strong alkalis

**Hazardous Decomposition Products**
Oxides of carbon – hydrogen halides – fluorocarbons – carbonyl halides
11. TOXICOLOGICAL INFORMATION

**Acute Toxicity**
Heptafluoropropane
4 hour LC50 (rat) >788,698 ppm
Low Observed Adverse Effect Concentration (LOAEC)/dog : 105000 ppm
Cardiac sensitization
No Observed Adverse Effect Concentration (NOAEC)/dog : 90000 ppm
Nitrogen
Simple asphyxiant
Helium
Simple asphyxiant

**Specific Target Organ Toxicity (STOT) – single exposure**
Nitrogen and Helium: Exposure to nitrogen and helium gas at high concentrations can cause suffocation by reducing oxygen available for breathing. Breathing very high concentrations can cause dizziness, shortness of breath, unconsciousness or asphyxiaion.

**Specific Target Organ Toxicity (STOT) – repeat exposure**
No data available.

**Serious Eye damage/Irritation**
No data available.

**Skin Corrosion/Irritation**
No data available.

**Respiratory or Skin Sensitization**
Heptafluoropropane: Not expected to cause skin sensitization based on review of properties of the substance. Did not cause respiratory sensitization in laboratory animals.

**Carcinogenicity**
Not considered carcinogenic by NTP, IARC, and OSHA.

**Germ Cell Mutagenicity**
Heptafluoropropane: Animal testing and testing on bacterial or mammalian cell cultures did not show mutagenic effects.

**Reproductive Toxicity**
Heptafluoropropane: Animal testing showed no reproductive toxicity. (Based on data obtained from similar substances.) Animal testing showed no developmental toxicity.

**Aspiration Hazard**
Not an aspiration hazard.

**Other**
Heptafluoropropane: Cardiac sensitization threshold limit : 730190 mg/m3
12. ECOLOGICAL INFORMATION

Ecotoxicity
Heptafluoropropane
LC50 > 200 mg/l zebra fish 96h
EC50> 200 mg/l Water flea 48h

Mobility in soil
Nitrogen occurs naturally in the atmosphere.

Persistence/Degradability
Nitrogen occurs naturally in the atmosphere.

Bioaccumulative Potential
Nitrogen occurs naturally in the atmosphere.

Other adverse effects
No relevant studies identified.

13. DISPOSAL CONSIDERATIONS

Disposal Methods
Dispose of container in accordance with all applicable local and national regulations. Do not cut, puncture or weld on or near to the pressurized container. If spilled, expellant will vaporize to the atmosphere.

14. TRANSPORT INFORMATION

DOT CFR 172.101 Data
Compressed Gas, N.O.S., (Heptafluoropropane, Nitrogen), (2.2)
UN1956

UN Proper Shipping Name
Compressed Gas, N.O.S., (Heptafluoropropane, Nitrogen)

UN Class
(2.2)

UN Number
UN1956

UN Packaging Group
None

Classification for AIR
Consult current IATA Regulations prior to shipping by air.

Transportation (IATA)

Containers must be shipped with the appropriate safety caps.

15. REGULATORY INFORMATION

United States TSCA Inventory
All components of this product are in compliance with the inventory listing requirements of the US Toxic Substance Control Act (TSCA) Chemical Substance Inventory.

Canada DSL Inventory
All ingredients in this product have been verified for inclusion on the Domestic Substance List (DSL).

SARA Title III Sect. 311/312 Categorization
Pressure Hazard
15. REGULATORY INFORMATION

SARA Title III Sect. 313
This product does not contain any chemicals that are listed in Section 313 at or above de minimis concentrations.

California Proposition 65
This product does not contain materials which the State of California has found to cause cancer, birth defects or other reproductive harm.

16. OTHER INFORMATION

NFPA Ratings
NFPA Code for Health - 1
NFPA Code for Flammability - 0
NFPA Code for Reactivity - 1
NFPA Code for Special Hazards - None

HMIS Ratings
HMIS Code for Health - 1
HMIS Code for Flammability - 0
HMIS Code for Physical Hazard - 1
HMIS Code for Personal Protection - See Section 8
*C Chronic

Legend
ACGIH: American Conference of Governmental Industrial Hygienists
CAS#: Chemical Abstracts Service Number
EC50: Effect Concentration 50%
IARC: International Agency for Research on Cancer
LC50: Lethal Concentration 50%
LD50: Lethal Dose 50%
N/A: Denotes no applicable information found or available
OSHA: Occupational Safety and Health Administration
PEL: Permissible Exposure Limit
RQ: Reportable Quantity
STEL: Short Term Exposure Limit
TLV: Threshold Limit Value
TSCA: Toxic Substance Control Act

Revision Date: July 2, 2015
Changes made: Updated to GHS Classification.

Information Source and References
This SDS is prepared by Hazard Communication Specialists based on information provided by internal company references.

Prepared By: EnviroNet LLC.
FM-200 is a registered trademark of DuPont.
16. OTHER INFORMATION

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