AlliedSignal
CHEMICALS

MATERIAL SAFETY DATA SHEET
Genetron® 404A

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Genetron® 404A

OTHER/GENERIC NAMES: Pentafluoroethane/1,1,1 trifluoroethane/1,1,1,2 Tetrafluoroethane

PRODUCT USE: Refrigerant

MANUFACTURER: AlliedSignal, Inc.
Flourocarbons
101 Columbia Road
P. O. Box 1053
Morristown, NJ 07962

FOR MORE INFORMATION CALL:
(Monday-Friday, 9:00am-4:30pm)Eastern Standard Time
Product Safety Department (201)-455-4157

IN CASE OF EMERGENCY CALL:
(24 Hours/Day, 7 Days/Week)
(201) 455-2000

2. COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT NAME	CAS #	WEIGHT %
Pentafluoroethane (HFC-125)	354-33-6	44
1,1,1-Trifluoroethane (HFC-143a)	420-46-2	52
1,1,1,2-Tetrafluoroethane (HFC-134a)	811-97-2	4

Trace impurities and additional material names not listed above may also appear in the Regulatory Information section (#15) towards the end of the MSDS. These materials may be listed for local "Right to Know" compliance and for other reasons.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Colorless, volatile liquid with ethereal and faint sweetish odor. Non-flammable material. Overexposure may cause dizziness and loss of concentration. At higher levels, CNS depression and cardiac arrhythmia may result from exposure. Vapors displace air and can cause asphyxiation in confined spaces. At high temperatures, (> 250° C), decomposition products may include Hydrochloric Acid (HCl), Hydrofluoric Acid (HF), and carbonyl halides such as phosgene.

POTENTIAL HEALTH HAZARDS:

SKIN: Irritation would result from defatting action on tissue. Liquid contact may cause frostbite. Necrosis from freezing of tissue could occur.

EYES: Liquid contact can cause irritation, which may be severe. Mist may irritate.

INHALATION: 404A is of low order of acute toxicity in animals. When oxygen levels in air are reduced to 12-14% by diplacement, symptoms of asphyxiation, loss of coordination, increased pulse rate and deeper respiration will occur. At higher levels, cardiac arrythmia may occur.

INGESTION: Although ingestion is unlikely, discomfort in the gastrointestinal tract would result from the rapid evaporation (boiling) of the material, and consequent evolution of gas. In addition, some of the effects of inhalation would be expected.

DELAYED EFFECTS: None known

Ingredients found on one of the OSHA designated carcinogen lists are listed below.

Ingredient Name	NTP Status	IARC Status	OSHA List

No ingredients listed in this section

4. FIRST AID MEASURES

SKIN: Promptly flush skin with water until chemical is removed. If there is evidence of frostbite, bathe (do not rub) with lukewarm, not hot, water. In the absence of water, cover with soft clean cloth or similar covering. Call a physician.

EYE: Immediately flush eyes with large amounts of water for at least fifteen minutes [in case of frostbite water should be lukewarm, not hot,], lifting eyelids occasionally to facilitate irrigation. Get medical attention if symptoms persist.

INHALATION: Immediately remove to fresh air. If breathing has stopped, give artificial respiration. Use oxygen as required, provided a qualified operator is available. Call a physician. Do not give epinephrine (adrenaline).

INGESTION: Ingestion is unlikely because of the physical properties of the azeotrope and is not expected to be hazardous. Do not induce vomiting unless instructed to do so by a physician.

ADVICE TO PHYSICIAN: Because of possible disturbances of cardiac rhythm, catecholamine drugs such as epinephrine, should be used with special caution only in situations of emergency life support. Treatment of overexposure should be directed at the control of symptoms and the clinical conditions.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:
FLASH POINT: Gas, not applicable per DOT regulations.
FLASH POINT METHOD: ASTM D 1310-67 and ASTM D 56-82
AUTOIGNITION TEMPERATURE: Unknown
UPPER FLAME LIMIT (Volume % in air): None
LOWER FLAME LIMIT (Volume % in air): None
FLAME PROPAGATION RATE (Solids): Not applicable
OSHA FLAMMABILITY CLASS: Not applicable

EXTINGUISHING MEDIA:
Use any standard agent - choose the one most appropriate for type of surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Contact with certain reactive metals may result in formation of explosive or exothermic reactions under specific conditions (e.g., very high temperatures and/or appropriate pressures).

SPECIAL FIREFIGHTING PRECAUTIONS/INSTRUCTIONS:
Firefighters should wear self-contained, NIOSH-approved breathing apparatus for protection against possible toxic decomposition products. Proper eye and skin protection should also be provided. Use water spray to keep fire-exposed containers cool.

6. ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE: (Always wear recommended personal protective equipment.)
Evacuate all unprotected personnel. Protected personnel should remove any ignition sources and shut off leak, if without risk, and provide ventilation. Unprotected personnel should not return until air has been tested and determined safe, including low-lying areas.

Spills and releases may have to be reported to Federal and/or local authorities. See the Regulatory Information section (#15) regarding reporting requirements.

7. HANDLING AND STORAGE

NORMAL HANDLING: (Always wear recommended personal protective equipment.)
Avoid breathing vapors or liquid contact with eyes, skin or clothing. Do not puncture or drop cylinders or expose them to open flame or excessive heat. Use authorized cylinders only. Follow standard safety precautions for handling and use of cylinders of compressed gases.

STORAGE RECOMMENDATIONS:
Store in a cool, well-ventilated area of low fire risk and out of direct sunlight. Protect cylinder and its fittings from physical damage. Do not heat the container or store at a temperature above 125°F(51.7°C). Storage in subsurface locations should be avoided. Close valve tightly after use and when empty.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

Provide local exhaust at filling zones and areas where leakage is probable. Mechanical (General) ventilation may be adequate for other operating and storage areas.

PERSONAL PROTECTIVE EQUIPMENT:

SKIN PROTECTION:

Wear protective, impervious gloves and clothing with an outer layer of MYLAR®-coated Durafab (2nd choices: PVA or neoprene), if prolonged or repeated contact with liquid is anticipated. Remove and wash clothing promptly, if wet. Any non-impervious clothing should also be promptly removed when contaminated and washed before reuse.

EYE PROTECTION:

For normal conditions, wear safety glasses. Where there is reasonable probability of liquid contact, wear chemical safety goggles.

RESPIRATORY PROTECTION:

None generally required for adequately ventilated work situations. For accidental release, non-ventilated situations, or release into confined space, use a self-contained, NIOSH-approved breathing apparatus or supplied air respirator. For escape: use the former or a NIOSH-approved gas mask with organic vapor canister.

ADDITIONAL RECOMMENDATIONS:

In case of spillage or leakage, or if there is the probability of contact with liquid product, impervious boots and clothing should be used. High dose-level warning signs are recommended for areas of principle exposure. Provide eyewash stations and quick-drench shower facilities at convenient locations. For tank cleaning operations, see OSHA regulations.

EXPOSURE GUIDELINES: (Guidelines exist for the following ingredients)

Ingredient Name	ACGIH TLV	OSHA PEL	Other Limit
Pentafluoroethane (HFC-125)	None	None	** 1000 ppm TWA
1,1,1-Trifluorcethane (HFC-143a)	None	None	* 1000 ppm TWA
1,1,1,2-Tetrafluoroethane (HFC-134a)	None	None	* 1000 ppm TWA ** 1000 ppm TWA

* = Limit established by AlliedSignal for internal use.
** = Workplace Environmental Exposure Level (AIHA).
*** = Biological Exposure Index

Other exposure limits for the decomposition products normally associated with product use are as follows:

Hydrogen Fluoride: ACGIH TLV: 3 ppm ceiling

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Clear colorless liquid and vapor.
PHYSICAL STATE: Gas at normal temperatures.
MOLECULAR WEIGHT: 97.6
CHEMICAL FORMULA: CHF_2CF_3 (GENETRON® 125): 44% wt. ±2
CH_3CF_3 (GENETRON® 143a): 52% wt. ±2
CH_2FCF_3 (GENETRON® 134A): 4% wt. ±2
ODOR: Faint ethereal odor.
SPECIFIC GRAVITY: (Water = 1.0) 1.08 @ 70°F
SOLUBILITY IN WATER: (Weight %) Unknown
pH: Neutral
BOILING POINT: -47.8°C(-54.0°F)
MELTING POINT: Unknown
VAPOR PRESSURE: 182.9 PSIA @ 77°F
370.9 PSIG @ 130°F
VAPOR DENSITY: (Air = 1.0) 3.43
EVAPORATION RATE: Greater than 1 Compared to: CCl_4
% VOLATILES: % volitales by volume @ 68°F (20°C) = 100
FLASH POINT: Gas, not applicable per DOT regulations.
(Flash point method and additional flammability data are found in section 5.)

10. STABILITY AND REACTIVITY

NORMALLY STABLE? (Conditions to Avoid)

The product is stable.
Do not mix with oxygen or air above atmospheric pressure. Any source of high temperature, such as lighted cigarettes, flames, hot spots, welding may yield toxic and/or corrosive decomposition products.

INCOMPATIBILITIES:

(Under specific conditions: e.g., very high temperatures and/or appropriate pressures).
Freshly abraded aluminum surfaces (may cause strong exothermic reaction). Chemically active metals: sodium, potassium, calcium, powdered aluminum, magnesium, and zinc.

HAZARDOUS DECOMPOSITION PRODUCTS:

Halogens, halogen acids, and possibly carbonyl halides. These are toxic and corrosive.

HAZARDOUS POLYMERIZATION?

Will not occur.

11. TOXICOLOGICAL INFORMATION

IMMEDIATE (ACUTE) EFFECTS:

LC_{50} 4HR Rat: Greater than or equal to 500,000 ppm (HFC-134a)
Cardiac Sensitization Threshold: Greater than or equal to 75,000 ppm (HFC-134a)

DELAYED (SUBCHRONIC & CHRONIC) EFFECTS:

Subchronic NOEL - Rat: Greater than or equal to 40,000 ppm (HFC-143a)
Teratology - negative on all components

OTHER DATA:

Not active in four genetic tests.

12. ECOLOGICAL INFORMATION

Degradability (BOD): The mixture is a gas at room temperature, therefore, it is unlikely to remain in water.
Octanol Water Partition Coefficient: Unknown for mixture.

13. DISPOSAL CONSIDERATIONS

RCRA:

Is the unused product a RCRA hazardous waste if discarded? Product is not a hazardous waste.
If yes, the RCRA ID number is: Not applicable

OTHER DISPOSAL CONSIDERATIONS: (Disposal must comply with federal, state, and local diposal or discharge laws.) Disposal of waste 404A may be subject to federal regulations. Users should review their operations, then consult with appropriate regulatory agencies before discharging or disposing of waste

material. Disposal by licensed waste disposal company may be necessary.

The information offered here is for the product as shipped. Use and/or alterations to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classification and the proper disposal method.

14. TRANSPORT INFORMATION

US DOT HAZARD CLASS: Compressed Gases, N.O.S. (Pentafluoroethane, 1,1,1 Trifluoroethane, Tetrafluoroethane), 2.2, UN1956

US DOT ID NUMBER: UN1956

For additional information on shipping regulations affecting this material, contact the information number found on the first page.

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA):

TSCA INVENTORY STATUS: HFC-125, HFC-143a, and HFC-134a are on the TSCA inventory.

OTHER TSCA ISSUES: Two components are subject to SNUR: HFC-125 CFR SECTION 721.3240, HFC-143a - 40CFR SECTION 721.3254

SARA TITLE III/CERCLA:

RQs & TPQs:

"Reportable Quantities" (RQs) and/or "Threshold Planning Quantities" (TPQs) exist for the following ingredients.

Ingredient	SARA/CERCLA RQ(lbs)	SARA EHS TPQ(lbs)

No ingredients listed in this section

Spills/releases resulting in the loss of any ingredient at or above its RQ requires immediate notification to the National Response Center (1-800-424-8802) and to your Local Emergency Planning Committee.

SECTION 311 HAZARD CLASS: IMMEDIATE PRESSURE

SARA 313 TOXIC CHEMICALS:

The following ingredients are SARA 313 "Toxic Chemicals". CAS #'s and wt.% are found in section #2.

Ingredient	Comment

No ingredients listed in this section

STATE RIGHT TO KNOW:

In addition to the ingredients found in section 2, the following are listed for state right-to-know purposes:

Ingredient	Wt.%	Comment
No ingredients listed in this section.		No ingredients listed in this section.

ADDITIONAL REGULATORY INFORMATION:

WARNING

DO NOT VENT TO THE ATMOSPHERE. TO COMPLY WITH PROVISIONS OF THE U.S. CLEAN AIR ACT, ANY RESIDUAL MUST BE RECOVERED.

CONTAINS GENETRON 125, 143a and 134a all HFCs, GREENHOUSE GASES WHICH MAY CONTRIBUTE TO GLOBAL WARMING.

FOR ADDITIONAL INFORMATION ON THE ABOVE CHEMICALS, SEE THE MATERIAL SAFETY DATA SHEETS FOR INDIVIDUAL COMPONENTS.

WHMIS CLASSIFICATION (CANADA):
Not determined

FOREIGN INVENTORY STATUS:
Not determined

16. OTHER INFORMATION

CURRENT ISSUE DATE: September 1994
PREVIOUS ISSUE DATE: No Previous Date

CHANGES TO MSDS FROM PREVIOUS ISSUE DATE ARE DUE TO THE FOLLOWING:
Not applicable

OTHER INFORMATION: HMIS Classification 1-0-1
NFPA Classification 1-0-1
REGULATORY STANDARDS:
(1) OSHA regulations for compressed gases: 29CFR SECTION 460.101.
(2) DOT Classification per 49CFR SECTION 172.101.