aircraft worldwide released an estimated average of 933 pounds of Halon 1301 annually, of which 158 pounds was released above 30,000 feet. While EPA is awaiting the results of the ODP calculations of CF_3I, it is unlikely that such low emissions at high altitude will pose a significant threat to the ozone layer.

Interest in this agent is very high because it may constitute a drop-in replacement to Halon 1301 on a weight and volume basis. Initial tests have shown its weight equivalence for fire extinguishment to be 1.36, and its volume equivalence to be 1.0, while for explosion inertion it is 1.42 and 1.04 respectively. The research community is continuing to qualify the properties of this agent, including its materials compatibility, its storage stability and its effectiveness. While the manufacturer's SNAP submission only requests listing in normally unoccupied areas, preliminary cardiosensitization data received by the Agency indicate that CF_3I has a NOAEL of 0.2 per cent and a LOAEL of 0.4 per cent, and thus this agent would not be suited for use in normally occupied areas.

(c) Gelled Halocarbon/Dry Chemical Suspension. *Gelled Halocarbon/Dry Chemical Suspension is acceptable as a Halon 1301 substitute in normally unoccupied areas.* Any employee who could possibly be in the area must be able to escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.

The manufacturer is proposing to blend either of two halocarbons (HFC–125 or HFC–134a) with either ammonium polyphosphate (which is not corrosive) or monoammonium phosphate (which is corrosive on hard surfaces). An initial assessment of inhalation toxicology of fine particulates indicates that some risk exists of inhalation exposure when the particles are below a certain size compared to the mass per cubic meter in air. Particle sizes less than 10 to 15 microns and a mass above the ACGIH nuisance dust levels raise concerns which need to be further studied. In a total flooding application, the exposure levels may be of concern. In addition, because the discharge of powders obscures vision, evacuation could be impeded. EPA is asking manufacturers of total flooding systems using powdered aerosols to submit to the Agency a review of the medical implications of inhaling atmospheres flooded with fine powder particulates. While the manufacturer requested a SNAP listing for unoccupied areas only, EPA would not consider its use in occupied areas until the requested peer review is complete. Meanwhile, EPA is finding this technology acceptable for use in normally unoccupied areas.

For further discussion of this agent, including a review of particle size distributions, see the listing under ''Streaming Agents—Acceptable.''

(d) Inert Gas/Powdered Aerosol Blend. *Inert Gas/Powdered Aerosol Blend is acceptable as a Halon 1301 substitute in normally unoccupied areas.* In areas where personnel could possibly be present, as in a cargo area, the employer shall provide a pre-discharge employee alarm capable of being perceived above ambient light or noise levels for alerting employees before system discharge. The pre-discharge alarm shall provide employees time to safely exit the discharge area prior to system discharge.

This alternative agent is formulated from a mixture of dry powders pressed together into pill form. Upon exposure to heat from a fire, a pyrotechnic charge initiates a series of exothermic, gas-producing reactions composed mainly of a mixture of nitrogen, carbon dioxide and water vapor, with small amounts of carbon monoxide, nitrous oxide, nitrogen dioxide, and solid residues. The oxygen level in the room is largely depleted, thus extinguishing the fire.

The manufacturer has proposed this technology for use in normally unoccupied areas only, such as engine nacelles and engine compartments, aircraft dry bay areas and unoccupied cargo areas. Comparing agents alone, deployment of 2.0 pounds of this agent at 400°F has an equivalent fire suppression effectiveness to 1.0 pound of Halon 1301 at 70°F.

This agent has no ODP. The carbon dioxide generated in the combustion of this agent has a GWP of 1.

b. Acceptable Subject to Narrowed Use Limits

(1) Total Flooding Agents. (a) C_3F_8. *C_3F_8 is acceptable as a Halon 1301 substitute where other alternatives are not technically feasible due to performance or safety requirements: a) due to their physical or chemical properties or b) where human exposure to the agents may approach cardiosensitization levels or result in other unacceptable health effects under normal operating conditions.* This agent is subject to the use conditions stipulated for all total flooding agents, that is:

- Where egress from an area cannot be accomplished within one minute, the employer shall not use this agent in concentrations exceeding its NOAEL.
- Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its LOAEL.
- Agent concentrations greater than the LOAEL are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.

Cup burner tests in heptane indicate that C_3F_8 can extinguish fires in a total flood application at concentrations of 7.30 per cent and therefore has a design concentration of 8.8 per cent. The cardiotoxic NOAEL of 30 per cent for this agent is well above its extinguishment concentration; therefore, it is safe for use in occupied areas. This agent has a weight equivalence of two-to-one by weight compared to Halon 1301.

Using agents in high concentrations poses a risk of asphyxiation by displacing oxygen. With an ambient oxygen level of 21 per cent, a design concentration of 22.6 per cent may reduce oxygen levels to approximately 16 per cent, the minimum level considered to be required to prevent impaired judgment or other physiological effects. Thus, the oxygen level resulting from discharge of this agent must be at least 16 per cent.

This agent has an atmospheric lifetime of 3,200 years and a 100-year GWP of 6,100. Due to the long atmospheric lifetime of C_3F_8, the Agency is finding this chemical acceptable only in those limited instances where no other alternative is technically feasible due to performance or safety requirements. In most total flooding applications, the Agency believes that alternatives to C_3F_8 exist. EPA intends that users select C_3F_8 out of need and that this agent be used as the agent of last resort. Thus, a user must determine that the requirements of the specific end-use preclude use of other available alternatives.

Users must observe the limitations on C_3F_8 acceptability by undertaking the following measures: (i) Conduct an evaluation of foreseeable conditions of end use; (ii) determine that human exposure to the other alternative extinguishing agents may approach or result in cardiosensitization or other unacceptable toxicity effects under normal operating conditions; and (iii) determine that the physical or chemical properties or other technical constraints of the other available agents preclude their use.

EPA recommends that users minimize unnecessary emissions of this agent by