

(UNCLASSIFIED)

ARMY R-22 STRATEGY

July 2019



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Prospective Technology, Incorporated
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in support of the Environmental Support Office, SAAL-ESO,
Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology.

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THE OZONE HOLE AND THE MONTREAL PROTOCOL

Discovery of the Ozone Hole

In 1974 scientists published the first scientific hypotheses that chemicals we produced could harm the stratospheric ozone layer. The ozone layer protects the earth against excessive ultraviolet radiation, which can cause genetic damage to human, plant, and animal cells. Scientists found that heavy chlorofluorocarbon gases (CFCs), which were widely used and viewed as posing no harm, could migrate to the stratosphere, remain intact for decades to centuries, and by releasing chlorine, break down the ozone layer.

Montreal Protocol

In 1977 the United Nations Environment Programme (UNEP) concluded a World Plan of Action on the Ozone Layer, which called for intensive international research and monitoring. In 1981, the Governing Council authorized UNEP to draft a global framework on stratospheric ozone protection. The Vienna Convention, concluded in 1985, is an accord in which 28 signatory countries agreed to cooperate in research, exchange information, and adopt “appropriate measures” to protect life. These obligations, however, contained no restrictions on ozone-depleting substances (ODS).

A UNEP Working Group began negotiations on a follow-up document. The Montreal Protocol was concluded in September of 1987 and went into effect on January 1, 1989. In all, 46 countries ratified the original Protocol, and there are now 197 signatories.

The Protocol initially required that the consumption (defined as production and import) of CFCs, halons, carbon tetrachloride and methyl chloroform be frozen by the year 2000. These are the Class I ODS. A year later, however, the freeze was changed to a ban, with the London Amendment prohibiting the consumption of Class I ODS starting in 2000. Two years later, the Copenhagen Amendment brought the ban back to January 1, 1994 for halons and January 1, 1996 for all other Class I ODS.

The Copenhagen Amendment also added an entire new category of ODS: Annex C, more commonly known as Class II ODS. These ODS are hydrochlorofluorocarbons (HCFCs) used as fire suppressants, refrigerants and solvents and represented the first wave of Class I ODS alternatives. Where Class I ODS have ozone-depleting potentials (ODPs) of up to 16, the ODPs of HCFCs range from 0.008 to 0.12.

The Copenhagen Amendment identified 34 Class IIs without establishing any controls. The following Meeting of the Parties in Vienna in 1995 established a production freeze in 1996 and a consumption phase-out date of 2030. The Montreal Amendment in 1997 set the Class II phase-out date for developing (Article 5) nations at 2040.

The Beijing Amendment of 1999 created a tiered phasedown schedule for Class II ODS. From a 1990 baseline, developed countries’ consumption had to be reduced 35% by 2004, 75% by 2010, and 90% by 2015. Article 5 countries followed a similar schedule.

Clean Air Act

Title VI of the Clean Air Act (CAA) of 1990 codified the Class I ODS bans into U.S. law. It introduced various requirements and restrictions on the servicing of equipment using ODS, including stationary (Section 608) and mobile (Section 609) air conditioning and refrigeration (AC&R) systems. It also introduced the Significant New Alternatives Policy (SNAP) program (Section 612), by which the Environmental Protection Agency (EPA) controls - approves, limits and/or disapproves - the use of ODS alternatives by chemical composition in all industrial sectors where ODS are utilized.

Title VI also gave the EPA a wide range of powers for the regulation and control of the consumption and use of Class II ODS. Subsequently, the EPA implemented the tiered phasedown of HCFCs in the Beijing Amendment of the Montreal Protocol. The consumption of R-22 was banned starting in 2010, except for use in equipment manufactured before 2010. R-22 production and import was completely banned in 2020, ten years before the complete ban of all HCFCs.

R-22

By 1990, roughly 1.5 billion pounds of R-22 were providing AC&R for almost 100 million homes, offices, schools, stores, factories and other facilities in the United States. In the aftermath of the Ozone Hole and the Montreal Protocol, Freon (CFCs R-11 and R-12) was shunned and R-22 - chlorodifluoromethane - was the most commonly used refrigerant in the country. It was very efficient, very cheap, non-flammable and with very low toxicity. And it wasn't seen as an ODS until the Copenhagen Amendment in 1992.

R-22 is still the most commonly used refrigerant in domestic and commercial building air conditioners. And even with the CAA and EPA prohibitions and regulations, R-22 is still available today. Section 608 of the CAA requires that all refrigerants be recovered and not vented to the environment, so R-22 has been recycled. However, the best industry estimates indicate that since the turn of the century, only 5-10% of the replaced refrigerant in commercial air conditioners has been recovered. New air conditioning units now use the refrigerant R-410A, which is not ODS but is a global warmer. There are commercially available "drop-in" alternatives to R-22, which are blends of other refrigerants that come close to the physical and performance characteristics of R-22.

R-22 is also still the most common refrigerant in Army standard Environmental Control Units (ECUs). ECUs are used for tactical equipment cooling in communications, electronics and command-and-control shelters, as well as comfort cooling of personnel in temporary shelters. Army-standard ECUs are managed by the U.S. Army Communications and Electronics Command (CECOM), and the ESO has been working with CECOM for decades in identifying R-22 alternatives for retrofit and new production.

In addition to Army standard ECUs, theatre Commanders with Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) and Program Managers (PMs) with new, unique cooling requirements have introduced commercial, non-standard R-22 ECUs into the Army inventory.

ESTABLISHMENT OF THE DOD ODS RESERVE

Army Requirements for ODS

The 1989 Department of Defense (DoD) Directive 6050.9, "Chlorofluorocarbons and Halons," required the Services to ensure that "required amounts and types of CFCs and halons are available for mission-critical applications when substitutes are not yet available." In response, Department of the Army Letter 200-90-1, "Eliminating or Minimizing Atmospheric Emissions of Ozone-Depleting Substances," first defined the Army's mission-critical applications of halons and CFCs in tactical equipment.

On August 11, 1992, the Under Secretary of Defense tasked the Military Departments to estimate and fund their ODS requirements. In December 1992, the Defense Logistics Agency (DLA) requested that the Services provide estimates of how much Class I ODS they would need to support their weapon systems until they were either modified or retired. They were also asked to provide estimates of how much of this requirement could be satisfied through the turn-in of excess ODS, and how much additional Class I ODS would then need to be procured to satisfy the remainder of their requirements.

The DOD ODS Reserve

The National Defense Authorization Act for Fiscal Year 1993 tasked DLA to support the ODS requirements for the DoD. Specifically, DLA was directed to 1) evaluate the use of ODS by the Military Services, 2) develop plans to reclaim, recycle, and reuse ODS, 3) create and maintain a stockpile or "Reserve" of Class I ODS, and 4) report their progress on these actions to Congress. In light of the Services' ongoing bottom-up review of future personnel, mission, and resource requirements, in July 1993 the DLA requested that they revalidate their ODS mission-critical requirements.

The DoD ODS Reserve was set up at the Defense Depot Richmond Virginia (DDRV), with administrative offices at the Defense Supply Center Richmond (DSCR) - now DLA-Aviation. It went on-line on January 1, 1994. Since the Defense ODS Reserve is Congressionally directed, DLA pays for storage, packaging and even shipment to the operators. Units are charged two cents per container, whether it holds from 2 to 2,000 pounds of ODS. Requisitions for ODS are processed through the DoD wholesale supply system, but issues are controlled (approved) by the individual Services. Each Service owns the product in their "account," and each Service manages their portion of the ODS Reserve.

Army ODS Reserve

The Environmental Support Office of the Assistant Secretary for Acquisition, Logistics and Technology (ASA(ALT)) (SAAL-ESO) manages the Army ODS Reserve. The ESO monitors Army ODS requirements, approves every individual requisition for ODS issued to an Army unit, performs oversight of Army ODS replacement and retrofit efforts at development and research activities and coordinates with the DoD ODS Reserve.

ARMY R-22 REQUIREMENTS

Mission Critical Uses

The Office of the Secretary of Defense (OSD) defined an ODS mission-critical requirement as either a situation where an ODS use is integral to a combat mission asset or it affects the operation of that asset. OSD directed the Services to designate their ODS mission critical requirements, and the Army initially identified just two Class I ODS, CFC-12 refrigerant and Halon 1301 fire suppression agent.

In 1998, the ESO supported the CECOM ECU PM in establishing a program for the development, qualification and fielding of a new ECU, called the Improved ECU (IECU). The IECU was to demonstrate improved reliability, maintainability, transportability, ruggedness and performance. The main selling point, however, was the use of a non-ODS refrigerant. The European Union (EU) had enacted ODS legislation that could preclude the deployment of ECUs to Germany after 2000.

Due to changing priorities, however, introduction of the IECUs into the Army inventory has been delayed. The Army currently has over 12,000 Army standard ECUs fielded that use R-22, with almost 1,800 in the European Theatre. Additionally, an ESO data call in 2016 identified that the Army has more than 6,000 other fielded combat/combat support systems that will require the continued availability of R-22 for many years.

The ESO monitors the development and implementation of EPA, EU and host nation legislation and regulation in regards to ODS. After 2000, the ESO grew concerned about potential impacts of approaching 2010 deadlines in the U.S., calling for a 75% reduction in the production and import of R-22 and a ban on the use of virgin R-22 in newly manufactured cooling systems. In 2005 and 2006 the ESO entered into discussions with the Defense ODS Reserve about establishing a stockpile of R-22.

In early 2007, ESO staff completed an R-22 need-analysis that showed a worst-case requirement of 60 tons of R-22 from 2010 through 2025, assuming that IECUs would begin fielding in 2026. If IECU fielding started in 2010, which was not budgeted, the total R-22 needed was reduced to 30 tons through 2025. The 60-ton value represented the conservative R-22 need, that could also accommodate unknown developments.

In November 2007, ASA(ALT) Deputy Assistant Secretary for Policy and Procurement signed a memorandum requesting that the Defense ODS Reserve establish an Army R-22 Reserve, by 2010 and containing a minimum of 120,000 pounds, to support Army mission critical requirements. It also requested that they accept and track all Army turn-ins of R-22, and they apply it toward the Army R-22 requirement.

The following June, the Assistant Chief of Staff for Installation Management (ACSIM) signed a memorandum directing Army garrisons to turn in all recovered R-22, not otherwise needed to meet their installation requirements, to the Defense ODS Reserve to meet future Army tactical needs.

THE ARMY R-22 USE MODEL

SUMMARY

When this effort began in the early 2000's, the ESO had already been working for 15 years on policy, logistics and procurement issues with the restrictions and prohibitions on Class I ODS. With Class II ODS, the number of systems effected are smaller, the numbers of chemicals are smaller and the size of the stockpile is smaller. Still, trying to project operational support +20 years into the future is a daunting task.

Until five years ago, the entire focus of the R-22 support was on the Army-standard ECUs. It was known that non-standard ECUs had been purchased in IOF/OEF, but the Army was unable to estimate or validate their numbers or R-22 support requirements. Likewise, it was anticipated that there were other Army weapon systems still using R-22, but the ECU requirements constituted the vast majority of the Army requirements. A data call in 2009 yielded no further information.

In 2013 the U.S. Army Aviation and Missile Command (AMCOM) identified ten new systems that require the continued availability of R-22, involving more than 5,700 pieces of equipment. In 2015 the PM for Army Watercraft Systems identified 50 additional platforms with requirements for R-22. The initial Army requirements given to the Defense ODS Reserve, however, were conservative enough to adequately address these applications.

On May 17, 2018, the Deputy Assistant Secretary for Acquisition Policy and Logistics signed a policy memorandum entitled "Ozone Depleting Substances and Their Alternatives." Paragraph 1 of the attached Instructions states: "All Army units, CONUS or OCONUS, are authorized to use ODS (Class I and Class II) until otherwise directed by their Army Command." Commanders of Army units deployed to the EU or any location, therefore, have the authority to operate and support their weapon systems' cooling equipment in-theatre iregardless of local environmental rules and regulations.

The Army has a critical, long-term need for R-22 and, like the Army Halon Reserve, provides R-22 to units at virtually no cost. Each R-22 issue costs the requisitioning Army unit two cents per container, up to a 1,050 lbs cylinder.

The Army R-22 Reserve, in its 9th year of operation, is running smoothly and efficiently, and is capable of supporting the R-22 needs of Army units until at least 2030.

APPENDIX 1: List of Acronyms

AC&R	- Air Conditioning and Refrigeration
ACSIM	- Assistant Chief of Staff for Installation Management
ASA(ALT)	- Assistant Secretary of the Army for Acquisition, Technology and Logistics
CAA	- Clean Air Act
CECOM	- Communications and Electronics Command
CFC	- Chlorofluorocarbon
CONUS	- Continental United States
DDRV	- DLA Distribution Richmond Virginia
DLA	- Defense Logistics Agency
DoD	- Department of Defense
DSCR	- Defense Supply Center Richmond
ECU	- Environmental Control Unit
EPA	- Environmental Protection Agency
ESO	- Environmental Support Office
EU	- European Union
HCFC	- Hydrochlorofluorocarbon
OCONUS	- Outside the Continental United States
ODS	- Ozone Depleting Substance
ODP	- Ozone Depleting Potential
OEF	- Operation Enduring Freedom
OIF	- Operation Iraqi Freedom
OSD	- Office of the Secretary of Defense
PM	- Product/Project/Program Manager
SNAP	- Significant New Alternatives Policy
UNEP	- United Nations Environmental Programme

APPENDIX 2: DASA(PP) R-22 Requirements Memo 11/20/07



DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY
ACQUISITION LOGISTICS AND TECHNOLOGY
103 ARMY PENTAGON
WASHINGTON DC 20310-0103

NOV 20 2007

SAAL-PE

MEMORANDUM FOR COMMANDER, DEFENSE SUPPLY CENTER
RICHMOND, (DEPARTMENT OF DEFENSE
RESERVE OF OZONE DEPLETING SUBSTANCES),
ATTN: DSCR-VO, 8000 JEFFERSON DAVIS
HIGHWAY, RICHMOND, VA 23297

SUBJECT: Army Reserve of Ozone Depleting Substances (ODS)

The U.S. Army has an emerging requirement for the ODS Reserve to supply Hydrochlorofluorocarbon HCFC-22 (commonly known as R-22), a Class II ODS refrigerant to support our tactical systems beginning in Calendar Year 2010. Beginning in 2010, the Clean Air Act eliminates the use of new HCFC-22 in new environmental control units (ECUs), a common component of fielded tactical systems. Post 2010, new or RESET tactical systems that are considered "new" may need recycled HCFC-22 to be sustained in the field. Additionally, legacy tactical systems that use R-22 may need a source of R-22 through 2024.

My Environmental Support Office (ESO) has estimated that the U.S. Army will require a reserve account containing a minimum of 120,000 pounds of R-22 produced prior to 2010 to support all tactical systems through the lifecycle. Therefore, I request that beginning as soon as possible, Defense Supply Center, Richmond accept and track turn-ins of recovered R-22 from U.S. Army installations. We will determine if additional R-22 will need to be procured as progress in establishing the R-22 reserve is made. This R-22 would need to be ready-for-issue by 2010.

Thank you for your continued support of our Soldiers. My points of contact are Mr. Dave Koehler, 703-304-1680, e-mail: david.a.koehler@us.army.mil and Mr. Jim Vincent, 314-614-3836, e-mail: jim.vincent1@us.army.mil.

A handwritten signature in black ink, appearing to read "E. Ballard".

E. Ballard
Deputy Assistant Secretary of the Army
(Policy and Procurement)

Copy Furnished:
SAAL-SMS
DAIM-ED

APPENDIX 3: DASA(APL) Policy: ODS and Their Alternatives 05/17/18



DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY
ACQUISITION LOGISTICS AND TECHNOLOGY
103 ARMY PENTAGON
WASHINGTON DC 20310-0103

MAY 17 2018

SAAL-ESO

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Ozone Depleting Substances and Their Alternatives

1. Reference Memorandum, ASA (ALT), SAAL-PE, 8 Apr 13, subject: Minimizing the Use of Ozone-Depleting Substances.
2. This memorandum updates the reference policy to minimize our dependency on ozone-depleting substances (ODS) in our weapon systems and industrial processes. It also addresses the use of hydrofluorocarbons (HFCs) as the primary alternatives to ODS. Enclosed are implementing instructions.
3. After more than 30 years, science and technology has still not found suitable substitutes for certain critical ODS applications, and the HFC substitutes we have incorporated in new systems and retrofits are themselves under increasing regulatory scrutiny as greenhouse gases. Additionally, mishaps, including loss of life, have occurred due to the use of flammable counterfeit gases and improper handling of compressed gas cylinders.
4. As we move beyond seeking drop-in replacements, and turn to finding more environmentally friendly solutions, we must remain vigilant in choosing systems that are both safe and effective. We must also address the logistics challenges associated in sustaining our aging fleets of legacy systems that remain dependent upon ODS, and in maintaining the stockpile of mission-critical ODS for decades to come.
5. The Environmental Support Office is my lead for all issues concerning ODS and HFCs. They manage the Army ODS Reserve and provide oversight of regulatory and technical developments for fire suppression agents, refrigerants and solvents. Their expertise is available to support Program Managers, Logistics Managers and System Coordinators in developing, producing and maintaining Army weapon systems.
6. The point of contact is Ms. Amy Borman, Director, Environment Support Office, 703-697-1328, amy.l.borman.civ@mail.mil.

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A handwritten signature in black ink, appearing to read "Timothy G. Goddette".

Timothy G. Goddette
Acting Deputy Assistant Secretary of the
Army (Acquisition Policy and Logistics)

SAAL-ESO
SUBJECT: Ozone Depleting Substances and Their Alternatives

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SUBJECT: Ozone Depleting Substances and Their Alternatives

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Instructions for the Use of Ozone Depleting Substances
(ODS) and Their Alternatives

1. Use. All Army units, CONUS and OCONUS, are authorized to continue to use ODS (Class I and Class II) until otherwise directed by their Army Command.

2. Prohibitions.

2.1 New weapon systems, including non-developmental systems, and major modifications to existing weapon systems, are prohibited from using ODS. Waiver authority for systems that are not Acquisition Category (ACAT) I or II is delegated to the applicable Program Executive Officer (PEO).

2.2 Requisition of ODS from the Army ODS Reserve in support of Foreign Military Sales (FMS) or non-Army weapon system applications is prohibited. Requisition of parts or equipment containing ODS supplied from the Army ODS Reserve in support of FMS is also prohibited.

2.3 Requiring, purchasing or using ODS solvents is prohibited.

2.4 Commercial procurement of all refrigerants is prohibited.

2.5 Venting of ODS or hydrofluorocarbons (HFCs) is prohibited.

3. Approval of ODS Requirements in Contracts. United States Code (10 USC 2302) requires that a Senior Acquisition Official approve all contracts that require the use of a Class I ODS.

3.1 Supporting guidance exists at Federal Acquisition Regulation (FAR) Subpart 23.8, Defense Supplement 223.8 and Army Supplement 5123.8. See FAR clause(s) 52.223.11, 12, 20, 21 and 22 for applicability to specific requirements.

3.2 Approval authority is delegated to the PEO or equivalent General Officer/Senior Executive Service member. Further delegation is prohibited.

3.3 Contract approvals must be supported by a certification of need, stating that no suitable substitute is available. This certification must be signed by a Lead Approved Technical Representative, formally designated by the PEO. A copy of the approval and certification of need must be submitted to SAAL-ESO.

3.4 All requirements, solicitations and contracts must be reviewed to identify any requirement for the use of Class I ODS, with the following exceptions:

- (1) Contracts for commercial items that do not cite a Military Specification or Standard and whose use will not require support from the ODS Reserve,
- (2) Small Business Innovative Research contracts,
- (3) Contracts for personnel services, and
- (4) Software contracts.

3.5 PEOs should carefully consider the continued availability of ODS supplies before approving the purchase of ODS, or parts and equipment containing ODS, to support FMS systems or equipment.

4. Hydrostatic Retest. Fully charged and serviceable fire suppression system cylinders may remain in service beyond the hydrostatic retest date, and should not be removed solely for hydrostatic retest. When a cylinder has an expired retest date, the cylinder cannot be returned to serviceable condition by recharging until it has passed inspection

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and completed hydrostatic retest as prescribed by 49 CFR 180.209 Table 1. A fully charged cylinder should not be installed if the hydrostatic retest date has expired.

5. Portable Extinguishers. Fire extinguishers must be serviced, maintained and inspected as prescribed by 29 CFR 1910.157, Table L1. A portable extinguisher must be removed from a vehicle once its service life has expired. Service lives are set by the vehicle Program Manager and/or extinguisher Logistics Manager. Expired or un-serviceable halon extinguishers must be turned in to the Army ODS Reserve (see paragraph 8.3).

6. Alternatives. Alternatives must be evaluated for Soldier-worker-system interactions with military-unique operations and equipment. SAAL-ESO should be consulted when selecting a new refrigerant, fire suppressant or solvent. Any alternative under consideration must be approved by the Environmental Protection Agency under the Significant New Alternatives Program. Army Regulations 40-5 and 40-10 require that a toxicity clearance be obtained from the U.S. Army Public Health Center for any new chemical added to the Army supply system, and that the Program Manager request an update to the weapon system Health Hazard Assessment.

7. Life Cycle Support. Program Managers of systems still dependent on ODS must report projected fleet densities, planned modifications and overall system service life to SAAL-ESO, through their Department of the Army System Coordinators, at the end of the first quarter of each fiscal year, beginning in 2019.

8. Recovery and Disposition. During system servicing and maintenance, including refurbishment or retrofit, all ODS and HFCs must be recovered.

8.1 ODS and HFCs used in vehicle fire suppression systems are in pressurized, compressed gas cylinders that can be extremely dangerous if mishandled. Follow proper equipment and safety procedures to remove, store and transport them.

8.2 The transfer or exchange of any recovered Class I ODS or the Class II ODS refrigerant R-22 is prohibited. All recovered Class I ODS and R-22 refrigerant must be turned in to the Army ODS Reserve. Turn-in instructions are available at: www.dla.mil/Aviation/Offers/Services/AviationEngineering/OzoneDepRsrv.aspx.

8.3 Recovered HFCs may be transferred or exchanged. Defense Logistics Agency (DLA) Disposition Services will accept recovered HFCs. The customer, however, is responsible to identify the cylinder contents.

9. Program Support. SAAL-ESO is available to support PEOs and Program Managers in preparing documentation related to this policy, including certifications of need, contract approvals, annual reports and requests for waivers. SAAL-ESO can also provide technical support, 10 USC 2302 training and clarification of this policy.

10. Policy Waivers. Unless otherwise stated, requests for waivers must be submitted through SAAL-ESO to the Army Acquisition Executive for approval.

TABLE 1: OZONE DEPLETING SUBSTANCES

CLASS I ODS				
Chemical Name	Symbol	CAS No.	Ref No.	Common Name
Fire Suppressants				
Bromochlorodifluoromethane	CF2ClBr	353-59-3	Halon 1211	
Bromotrifluoromethane	CF3Br	75-63-8	Halon 1301	
Dibromotetrafluoroethane	C2F4Br2	124-73-2	Halon 2402	
Chlorobromomethane	CH2BrCl	74-97-5	Halon 1011	CBM
Bromodifluoromethane	HBFC-12B1	1511-62-2		FM-100
Refrigerants				
Trichlorofluoromethane	CFC-11	75-69-4	R-11	Freon 11
Dichlorodifluoromethane	CFC-12	75-71-8	R-12	Freon 12
Chlorotrifluoromethane	CFC-13	75-72-9	R-13	Freon 13
Pentachlorofluoroethane	CFC-111	354-58-5	R-111	
Tetrachlorodifluoroethane	CFC-112	76-12-0	R-112	
Dichlorotetrafluoroethane	CFC-114	76-14-2	R-114	
Chloropentafluoroethane	CFC-115	76-15-3	R-115	
Heptachlorofluoropropane	CFC-211	422-78-6		
Hexachlorodifluoropropane	CFC-212	3182-26-1		
Pentachlorotrifluoropropane	CFC-213	2354-06-5		
Tetrachlorotetrafluoropropane	CFC-214	2268-45-4		
Trichloropentafluoropropane	CFC-215	76-17-5		
Dichlorohexafluoropropane	CFC-216	661-97-2		
Chloroheptafluoropropane	CFC-217	76-18-6		
R-12 (74%) and HFC-152a (26%)			R-500	
R-12 (25%) and R-22 (75%)			R-501	
R-115 (51%) and R-22 (49%)			R-502	
R-13 (59.9%) and HFC-23 (40.1%)			R-503	
Solvents				
Tetrachloromethane	CCL4	56-23-5		Carbon Tet
1,1,1 Trichloroethane		71-55-6	TCA	Methyl Chloroform
Trichlorotrifluoroethane	CFC-113	76-13-1		Freon 113
Others				
Bromomethane		74-83-9	MBX	Methyl Bromide

CLASS II ODS

Chemical Name	HCFC	Symbol	CAS No.	Ref No.	Some Common Names
Dichlorofluoromethane	HCFC-21	CHFCl ₂	75-43-4	R-21	Freon 21
Monochlorodifluoromethane	HCFC-22	CHF ₂ Cl	75-45-6	R-22	Freon 22, Genetron 22, Forane 22, Refron 22, Freeze Mist, Dust-Off
Monochlorofluoromethane	HCFC-31	CH ₂ FCl	593-70-4	R-31	Genetron 31
Tetrachlorofluoroethane	HCFC-121	C ₂ HFC ₄	354-14-3		<lubricant>
Trichlorodifluoroethane	HCFC-122	C ₂ H ₂ FC ₃	354-21-2		<lubricant>
Dichlorotrifluoroethane	HCFC-123	C ₂ HFC ₃ Cl ₂	306-83-2	R-123	Suva 123, Freon 123, Genetron 123, Halotron I
Monochlorotetrafluoroethane	HCFC-124	C ₂ HFC ₄ Cl	2837-89-0	R-124	Suva 124, Freon 124, Genetron 124, FE-241
Trichlorofluoroethane	HCFC-131	C ₂ H ₂ FC ₃	359-28-4		
Dichlorodifluoroethane	HCFC-132b	C ₂ H ₂ F ₂ Cl ₂	1649-08-7		
Monochlorotrifluoroethane	HCFC-133a	C ₂ H ₂ F ₃ Cl	75-88-7		
Dichlorofluoroethane	HCFC-141b	C ₂ H ₃ FC ₂ Cl	1717-00-6		Ecolink 2005, Superflux Remover FR-A
Monochlorodifluoroethane	HCFC-142b	C ₂ H ₃ F ₂ Cl ₂	75-88-3	R-142b	Genetron 142b
Hexachlorofluoropropane	HCFC-221	C ₃ HFC ₆	422-26-4		
Pentachlorodifluoropropane	HCFC-222	C ₃ H ₂ F ₂ Cl ₅	422-49-1		
Tetrachlorotrifluoropropane	HCFC-223	C ₃ H ₂ F ₃ Cl ₄	422-52-6		
Trichlorotetrafluoropropane	HCFC-224	C ₃ H ₂ F ₄ Cl ₃	422-54-8		
Dichloropentafluoropropane	HCFC-225ca	C ₃ H ₂ F ₅ Cl ₂	422-56-0		Asahkin AK-225,
Dichloropentafluoropropane	HCFC-225cb	C ₃ H ₂ F ₅ Cl ₂	507-55-1		1664 Kleen Air
Monochlorohexafluoropropane	HCFC-226	C ₃ HFC ₆	431-87-8		
Pentachlorofluoropropane	HCFC-231	C ₃ H ₂ F ₂ Cl ₅	421-94-3		
Tetrachlorodifluoropropane	HCFC-232	C ₃ H ₂ F ₂ Cl ₄	460-89-9		
Trichlorotrifluoropropane	HCFC-233	C ₃ H ₂ F ₃ Cl ₃	7125-84-0		
Dichlorotetrafluoropropane	HCFC-234	C ₃ H ₂ F ₄ Cl ₂	425-94-5		
Monochloropentafluoropropane	HCFC-235	C ₃ H ₂ F ₅ Cl	460-92-4		
Tetrachlorofluoropropane	HCFC-241	C ₃ H ₃ FC ₄	666-27-3		
Trichlorodifluoropropane	HCFC-242	C ₃ H ₃ F ₂ Cl ₂	460-63-9		
Dichlorotrifluoropropane	HCFC-243	C ₃ H ₃ F ₃ Cl	460-69-5		
Monochlorotetrafluoropropane	HCFC-244	C ₃ H ₃ F ₄ Cl			
Trichlorofluoropropane	HCFC-251	C ₃ H ₄ FC ₃	421-41-0		
Dichlorodifluoropropane	HCFC-252	C ₃ H ₄ F ₂ Cl ₂	819-00-1		
Monochlorotrifluoropropane	HCFC-253	C ₃ H ₄ F ₃ Cl	460-35-5		
Dichlorofluoropropane	HCFC-261	C ₃ H ₅ FC ₂	420-97-3		
Monochlorodifluoropropane	HCFC-262	C ₃ H ₅ F ₂ Cl	421-02-03		
Monochlorofluoropropane	HCFC-271	C ₃ H ₆ FCl	430-55-7		

CLASS II ODS REFRIGERANT BLENDS

Refrigerant No.	HCFC	HCFC %	Ref. No. 2	Ref. No. 3	Ref No. 4	Some Common Names
R-401A	R-22	53	R-124*	R-152a	-	MP-39
R-401B	R-22	61	R-124*	R-152a	-	MP-66
R-402A	R-22	38	R-125	R-290	-	HP-80
R-402B	R-22	60	R-125	R-290	-	HP-81
R-403A	R-22	75	R-218	R-290	-	Isceon 69S
R-403B	R-22	56	R-218	R-290	-	Isceon 69L
R-405A	R-22	45	R-142b*	R-152a	R-C318	G2015
R-406A	R-22	55	R-142b*	R-600a	-	Autofrost GHG-X8
R-408A	R-22	47	R-143a	R-125	-	Forane FX-50
R-409A	R-22	60	R-124*	R-142b*	-	Forane FX-56
R-409B	R-22	65	R-124*	R-142b*	-	Forane FX-57
R-411A	R-22	87.5	R-152a	R-1270	-	
R-411B	R-22	94	R-152a	R-1270	-	
R-412A	R-22	70	R-142b*	R-218	-	Arcton TP-5R
R-414A	R-22	51	R-124*	R-142b	R-600A	Autofrost GHG-X4
R-414B	R-22	50	R-124*	R-142b	R-600A	Hot Shot
R-415A	R-22	82	R-152a	-	-	Mackfri-401a
R-415B	R-22	25	R-152a	-	-	Mackfri-401b
R-416A	R-124	39.5	R-134a	R-600	-	FR-12, FRG C
RB-276	R-142b	19	R-134a	Naptha	-	Free Zone

TABLE 2: HYDROFLUOROCARBONS**HFCs**

Chemical Name	HFC	Symbol	CAS No.	GWP	Common Names
Fluoroform	HFC-23	CHF ₃	75-46-7	12,400	R-23, FE-13, Freon 23
Difluoromethane	HFC-32	CH ₂ F ₂	75-10-5	677	R-32, Freon 32, methylene fluoride
Fluoromethane	HFC-41	CH ₃ F	593-53-3	116	Freon 41, methyl fluoride
Pentafluoroethane	HFC-125	CHF ₂ CF ₃	354-33-6	3,170	R-125, Genetron 125, Suva 125, FE-25
Tetrafluoroethane (1,1,2,2)	HFC-134	CHF ₂ CHF ₂	359-35-3	1,120	R-134
Tetrafluoroethane (1,1,1,2)	HFC-134a	CH ₂ FCF ₃	811-97-2	1,300	R-134a, Suva 134a, Genetron 134a
Trifluoroethane (1,1,2)	HFC-143	CH ₂ CHF ₂	420-46-2	328	R143, methylfluoroform
Trifluoroethane (1,1,1)	HFC-143a	CH ₃ CF ₃	430-66-0	4,800	R-143a, Genetron 143a
Difluoroethane (1,2)	HFC-152	CH ₂ FCH ₂ F	624-72-6	16	R-152
Difluoroethane (1,1)	HFC-152a	CH ₃ CHF ₂	75-37-6	138	R-152a, DFE
Fluoroethane	HFC-161	CH ₂ CH ₂ F	353-36-6	4	R-161
Heptafluoropropane	HFC-227ea	CF ₃ CHFCF ₃	431-89-0	3,350	FM-200, HFP, R-227ea
Hexafluoropropane (1,1,1,2,2,3)	HFC-236cb	CH ₃ FCF ₂ CF ₃	677-56-5	11,210	R-236cb
Hexafluoropropane (1,1,1,2,3,3)	HFC-236ea	CHF ₂ CHFCF ₃	431-63-0	1,330	R-236ea
Hexafluoropropane (1,1,1,3,3,3)	HFC-236fa	CF ₃ CH ₂ CF ₃	690-39-1	8,060	FE-36, R-236fa, Suva 236fa
Pentafluoropropane (1,1,2,2,3)	HFC-245ca	CH ₂ FCF ₂ CGF ₂	679-86-7	717	R-245ca
Pentafluoropropane (1,1,1,3,3,3)	HFC-245fa	CHF ₂ CH ₂ CF ₃	460-73-1	658	R-245fa, Genetron 245fa
Pentafluorobutane	HFC-365mfc	CH ₃ CF ₂ CH ₂ CF ₃	406-58-6	804	R-365mfc, SOLKANE 365
Decafluoropentane	HFC-43-10mee	CF ₃ CHFCHFCF ₂ CF ₃	138495-42-8	1,650	Vertrel XF

Adapted from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5), dated 2014

- No ethers (oxygenated compounds) are included

- Only HFCs with established Chemical Abstract Service (CAS) numbers are included

HFC Refrigerant Blends

Refrigerant No.	HFC	Ref #2	Ref #3	GWP	Some Common Names
R-404A	R-125	R-143a	R-134a	3,922	HP-62, FX-70
R-407A	R-32	R-125	R-134a	2,107	Klea 60
R-407B	R-32	R-125	R-134a	2,804	Klea 61
R-407C	R-32	R-125	R-134a	1,774	Klea 66, AC9000
R-407D	R-32	R-125	R-134a	1,627	
R-407E	R-32	R-125	R-134a	1,552	
R-407F	R-32	R-125	R-134a	1,825	Genetron Performax LT
R-410A	R-32	R-125	--	2,088	AZ-20, Puron, Suva 9100
R-410B	R-32	R-125	--	2,229	AC9100
R-413A	R-134a	R-218	R-600a	2,053	ISCEON 49
R-417A	R-125	R-134a	R-600	2,346	ISCEON 59, NU-22
R-417B	R-125	R-134a	R-600	3,027	
R-419A	R-125	R-134a	R-E170	2,967	
R-421A	R-125	R-134a	--	2,631	Choice 421A
R-421B	R-125	R-134a	--	3,190	Choice 421B
R-422A	R-125	R-134a	R-600a	3,143	ISCEON 79
R-422B	R-125	R-134a	R-600a	2,526	ICOR XAC1
R-422C	R-125	R-134a	R-600a	3,085	ICOR XLT1
R-422D	R-125	R-134a	R-600a	2,729	ISCEON MO29
R-423A	R-134a	R-227ea	--	2,280	
R-424A	R-125	R-134a	R-600a+	2,440	RS-44
R-425A	R-32	R-134a	R-227ea	1,505	
R-426A	R-125	R-134a	R-600+	1,508	RS-24
R-427A	R-32	R-125	R-143+	2,138	Forane 427A
R-428A	R-125	R-143a	R-290+	3,607	RS-52
R-429A	R-152a	R-E170	R-600a	14	
R-430A	R-152a	R-600	--	95	
R-431A	R-152a	R-290	--	38	
R-434A	R-125	R-143a	R-134a+	3,245	RS-45
R-435A	R-152a	R-E170	--	26	
R-437A	R-125	R-134a	R-600+	1,805	
R-438A	R-32	R-125	R-134a+	2,265	KDD5, ISCEON MO99
R-439A	R-32	R-125	R-600	1,983	
R-440A	R-134a	R-290	R-152a	144	
R-507A	R-125	R-143a	--	3,985	AZ-50
R-508A	R-23	R-116	--	13,214	Klea 5R3
R-508B	R-23	R-116	--	13,395	Suva 95

APPENDIX 4: ACSIM R-22 Turn-in Memo 06/12/08



DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT
600 ARMY PENTAGON
WASHINGTON, DC 20310-0600

DAIM-ZA

JUN 12 2008

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: R-22 Refrigerant Use on Army Installations

1. The Army has a long term requirement to use refrigerant R-22, a Class II ozone depleting substance (ODS), to support tactical equipment. Approximately 120,000 pounds of R-22 produced prior to 2010 are needed through 2024. The Clean Air Act of 1990 implements an international production phase-out of R-22 beginning in 2010. The law also reduces demand for R-22 by prohibiting its use in new equipment after 2010 and directs the recovery of all refrigerants when Air Conditioning and Refrigeration (AC&R) systems are serviced or retired. As Army installations service and replace aging air conditioning and refrigeration units, the recovered R-22 not otherwise needed to meet installation requirements will be stockpiled to meet the future tactical need.
2. To this end, the Defense Logistics Agency will accept and store recovered R-22 for the Army. The ODS Reserve, a function of Defense Supply Center, Richmond (DSCR), will fund the shipment of recovered R-22 to their facility, just as they currently do for Class I ODS. Therefore, effective immediately, installations will ship excess R-22 recovered from AC&R equipment to DSCR. ODS turn-in procedures are available from DCSR by e-mailing a request to odsreserve@dscr.dla.mil.
3. Personnel involved in the acquisition of new AC&R equipment, such as installation DPWs or Corps of Engineer project engineers, must be alert to suppliers and contractors, such as Energy Service Contractors, who may attempt to provide AC&R equipment using R-22 refrigerant in the project. While legal, this should be avoided.
4. The OACSIM POC is Mr. Joe R. Schroeder, DAIM-ISE, (703) 601-1572, email: joe.schroeder@us.army.mil and the ODS Reserve POC is Mr. Bobby Carwile, (704) 279-5203, email: rcarwile@dscr.dla.mil.

A handwritten signature in black ink, appearing to read "Robert Wilson".

ROBERT WILSON
Lieutenant General, GS
Assistant Chief of Staff
for Installation Management

APPENDIX 5: Army ODS Reserve Management Plan

Management of the U.S. Army Ozone-Depleting Substances (ODS) Reserve

A. Introduction

1. The Environmental Support Office (ESO) represents the Assistant Secretaries of the Army for Acquisition, Logistics and Technology (ASA(ALT)) and for Installations, Energy and the Environment (ASA(IEE)). The ESO is responsible for the overall management of the Army Reserve of Ozone-Depleting Substances (ODS). The Army ODS Reserve is a part of the Department of Defense (DoD) ODS Reserve.

2. The DoD ODS Reserve maintains a stockpile of man-made refrigerants, fire suppression agents and solvents whose production and import have been restricted, or banned altogether, because they have been identified by the Clean Air Act and the Montreal Protocol as being harmful to the stratospheric ozone layer. In the early 1990s the Military Services identified uses of ODS that were critical to their readiness, and associated quantities of each ODS that were necessary for the continued support of these weapon systems.

3. The Army ODS Reserve is the stockpile of these chemicals in the DoD ODS Reserve that supports the identified Army requirements. Each of the Services own the product in their own ODS Reserve. Additional quantities of some product have been turned in under Executive Order by other Federal Agencies and have either offset procurement requirements or provided safety levels for required products.

4. The DoD ODS Reserve is operated by the Defense ODS Reserve Program Office, which is part of the Defense Logistics Agency (DLA) - Aviation located in Richmond, Virginia. Through coordination with the DoD ODS Reserve, Program Managers, the Life Cycle Management Commands, the Department of the Army offices, operating units and other Army activities, the ESO monitors ODS requirements and ensures a stable supply of mission-critical ODS for Army long-term weapon system needs.

B. Tracking the Army ODS Requirement

1. ESO is responsible for ensuring that the Army ODS Reserve is capable of supporting the Army's identified ODS requirements, now and in the future.

2. The Army ODS Reserve is expected to be in operation until all Army weapon systems that require ODS have been retrofit or retired. This may be until 2050, or beyond.

3. Through analysis of historical use, force fleet size and service life projections, operational requirements and policy, the ESO prepares projections of critical Army ODS uses as-needed, for both war and peace-time, to ensure the continuing availability of this material for the war-fighter.

C. Operation and Maintenance

1. The DoD ODS Reserve shall perform the day-to-day operations to maintain the Army ODS Reserve according to their own internal procedures. These procedures shall be made available to the ESO upon request.
2. The DoD ODS Reserve shall provide monthly reports, by the end of the following month, with detailed information on Army requisitions and issues for all ODS products they manage. They shall also provide a ready-for-issue summary and information on all turn-ins. They may provide other internal reports.
3. The ESO shall provide and maintain Authorized Users Lists (AULs) for bulk Halon 1301, Halon 1301 hand-held fire extinguishers (HHFEs) and R-22 refrigerant. The ESO authorizes the ODS Reserve to issue product to Army units on the AULs without prior notification, within the limitations set elsewhere in this Plan.
4. The DoD ODS Reserve shall not issue any bulk Halon 1301, Halon 1301 HHFE or R-22 to an Army activity that is not on an ESO-approved AUL without approval via an email from the ESO.
5. The DoD ODS Reserve shall not issue any product other than bulk Halon 1301, Halon 1301 HHFEs or R-22 to any Army activity without approval via an email from the ESO.
6. The ESO shall review each Army requisition for ODS from an Army unit not listed on an applicable AUL and provide a decision to the ODS Reserve, to reject or accept the requisition, in a timely manner.
7. The ESO shall coordinate with the ODS Reserve before dissemination of any Army policy, guidance or instructional correspondence that may address or impact DoD or Army use of ODS.

D. Halon 1301 Operations

1. The DoD ODS Reserve shall maintain in ready-for-issue status adequate quantities of the Halon 1301 National Stock Numbers (NSNs) listed below for Army users:

NSN 6830-01-392-4154 (137 lbs)

NSN 6830-01-392-4999 (1,123 lbs)

2. These stock numbers are considered "free issue," but the supply system charges one cent for each cylinder issued.
3. The ESO shall provide and maintain an AUL for Halon 1301, and authorizes the ODS Reserve to issue bulk Halon to authorized Army units without prior notification, except for the restriction in paragraph 4 below.

4. The ODS Reserve shall not issue more than 2 (two) bulk cylinders of Halon 1301 per an individual requisition without prior approval from the ESO. The ODS Reserve shall put such a requisition on hold and notify the ESO. The ESO shall provide a determination for that requisition (accept or reject) in a timely manner.

5. If an Army activity requisitions Halon 1301 and they are not on the Army Halon AUL, the ODS Reserve shall put the requisition on hold and notify the ESO. The ESO shall provide a determination for that requisition (accept or reject) in a timely manner.

E. Halon HHFE Operations

1. Though not originally identified as a mission-critical Army ODS requirement, the DoD ODS Reserve also manages the Army requirements for the 2.75 pound Halon 1301 HHFE, NSN 6830-00-555-8837, at the request of the Army. The Army is not the only Service which requisitions and uses this fire extinguisher.

2. The ODS Reserve manages the procurement and distribution of Halon HHFEs purchased in support of Army Aviation requirements. Oversight of Army requisitions is provided by the ESO and the Army Program Executive Office (PEO) for Aviation.

3. The Halon 1301 in HHFEs issued to Army customers is accounted for as being removed from the Army ODS Reserve. Although the halon is "free issue," the requisitioning activity is still billed the standard supply price for each extinguisher, which represents the cost of the hardware and the filling service.

4. The ESO shall provide and maintain an Army AUL for Halon HHFEs, and authorizes the ODS Reserve to issue halon HHFEs to authorized Army units without prior notification, except for the restriction in paragraph 5 below.

5. The ODS Reserve shall not issue more than 25 HHFEs per individual requisition without prior approval from the ESO. The ODS Reserve shall put such a requisition on hold and notify the ESO. The ESO shall provide a determination for that requisition (accept or reject) via email in a timely manner.

6. The ODS Reserve shall notify the ESO of any requisition for an HHFE from an Army activity not listed in the AUL, and put the requisition on hold. The ESO shall provide a determination for that requisition (accept or reject) via email in a timely manner.

F. R-22 Operations

1. The Army has a requirement for 120,000 lbs of the Class II ODS refrigerant R-22, reclaimed to military standards. This is to support environmental control units (ECUs) and other mission-critical tactical cooling requirements until such time as the equipment is either retrofit with a non-ODS refrigerant or replaced.

2. Army installations and ECU repair activities have been directed to turn in recovered R-22 to the DoD ODS Reserve, through the same process as the turn-in of Class I ODS.

3. The ODS Reserve shall maintain in ready-for-issue status adequate quantities of R-22 in the NSNs listed below for Army users:

NSN 6830-01-567-8641 (44 lbs)	NSN 6830-01-641-8388 (44 lbs, dual port)
NSN 6830-01-641-8384 (128 lbs)	NSN 6830-01-567-8542 (128 lbs, dual port)
NSN 6830-01-567-9038 (1,050 lbs)	

4. These stock numbers are considered "free issue," but the supply system charges one cent for each cylinder issued.

5. The ESO shall provide and maintain an AUL for R-22, and authorizes the ODS Reserve to issue R-22 to authorized Army units without prior notification, except for the restriction in paragraph 6 below.

6. The ODS Reserve shall not issue R-22 in excess of 264 pounds per requisition without prior approval from the ESO. When such a requisition is received, the ODS Reserve shall put it on hold and notify the ESO. The ESO shall provide a determination for that requisition (accept or reject) in a timely manner via email.

7. The ODS Reserve shall notify the ESO of any requisition for R-22 from an Army activity not listed in the AUL, and put the requisition on hold. The ESO shall provide a determination for that requisition (accept or reject) in a timely manner via email.

G. Other ODS

1. All Class I ODS refrigerant assets in the Army ODS Reserve (R-11, R-12, R-114, R-500 and R-502) are considered excess to the Army requirements, and the DoD ODS Reserve may redistribute them to other Defense Services or Agencies at their discretion.

2. The DoD ODS Reserve shall support, to the best of their abilities, infrequent Army requirements for ready-for-issue ODS other than Halon 1301, R-22 and Halon HHFEs. Examples of such requirements are Halon 1211 and Halon 2402. The issue of ODS to support such unusual Army requirements must be only with the approval via email of the ESO.

3. The final disposition of all ODS products stored for the Army by the DoD ODS Reserve shall be determined by the Office of the Secretary of Defense at a later date.

H. Turn-in of ODS

1. If an Army activity does not have funding available to turn in ODS, the DoD ODS Reserve can assist. The Unit must contact the ODS Reserve at avnodsreserve@dla.mil and complete a Transportation Authorization Form.
2. The ODS Reserve does not offer assistance for any administrative or packaging costs associated with the turn-in of ODS.

I. Approval Signatures



Ms. Amy Borman
Director, Environmental Support Office (SAAL-ESO)

4 Oct. 2018
Date



Mr. Jeffrey Morsch
Program Manager, Defense Reserve of Ozone-Depleting Substances

20180907
Date