Appendix Y: Ozone-Depleting Substances

The Department of Defense (DoD) is committed to reducing the use of chemicals that negatively impact the environment. Under section 505 of Executive Order (E.O.) 13148, entitled "Greening the Government Through Leadership in Environmental Management," DoD and other federal agencies are required to reduce and manage the use of ozone-depleting substances (ODSs) at federal facilities. Various ODSs may accelerate destruction processes, resulting in lower-than-normal ozone levels. A diminished stratospheric ozone layer allows more radiation to reach the Earth's surface. For many people, overexposure to ultraviolet (UV) rays can lead to skin cancer, cataracts, and weakened immune systems. Increased UV radiation is also a factor in reduced crop yield and disruptions in the marine food chain.

There are two types of ODSs, Class I and Class II substances; Class I ODSs have a higher ozone-depleting potential than Class II substances. Examples of Class I substances listed in the Clean Air Act include chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl chloroform. The U.S. Environmental Protection Agency later added hydrobromofluorocarbons, methyl bromide, and chlorobromomethane to the list. When CFCs reach the stratosphere, the UV radiation from the sun causes these molecules to break down and release chlorine atoms which react with ozone, initiating the chemical cycles of ozone destruction that deplete the ozone layer. E.O. 13148 requirements include developing a plan to phase out acquisition of Class I ODSs by December 31, 2010. To ensure progress towards reducing ODS usage, DoD requires that Components annually report the status of any ODS Class I reduction plans in place or under development.

Army

The Army remains committed to the elimination of Class I ODSs. Since 1992, the Army has eliminated 99 percent of its use of these substances, 98 percent of CFC refrigerant use, and 90 percent of halon fire suppressant use.

The Army will not allow a continued dependency on Class I ODSs to degrade operational readiness, and army installations eliminated their dependency on the commercial availability of Class I ODSs. Though it is the responsibility of the installations to reuse CFC refrigerants recovered from retired or retrofitted air conditioning and refrigeration (AC&R) systems, installations are prohibited from supporting existing AC&R systems with new CFC refrigerants. Likewise, installations may still operate building fire suppression systems that use halon, but must retrofit them with a non-ODS system (preferably water) when discharged. Installations are prohibited from purchasing new halon or reusing halon recovered from retrofitted or retired building fire suppression systems. All recovered halon is turned in to the Army ODS Reserve.

Beginning in 2005, the Army implemented a new, aggressive ODS elimination policy that the Army Acquisition Executive issued on March 16, 2004, which emphasized the elimination of ODSs from legacy weapon systems. One example of how the Army complies with this policy is by continuing to retrofit the engine compartment fire suppression system in the Abrams Main Battle Tank. Program Management (PM) Office Combat Systems, in cooperation with Anniston Army Depot, replaced the Halon 1301 system with a system based on dry powder using baking soda. The Army plans to convert the entire fleet of Abrams Main Battle Tanks by 2015. The M9 Armored Combat Earthmover engine fire suppression system and Halon 1301 retrofitting began in 2005. In 2005, the Army also began retrofitting the engine fire suppression system in the M992 Field Artillery Ammunition Support Vehicle and Army watercraft, including Logistics Support Vehicles, Landing Craft Utility, and ocean-rated tugs, from Halon 1301 to the alternative non-ODS gas FM-200. The conversion is scheduled for completion in 2012.

In addition, the Army is converting the last tactical use of CFC refrigerants in the air conditioning systems of the Army's primary ambulance, the High-Mobility Multipurpose Wheeled Vehicle (HMMWV) version M997. This field retrofit, undertaken by PM Light Tactical Vehicles, will replace the Freon R-12 refrigerant with hydrofluorocarbon (HFC) refrigerant R-134a. The retrofit is complete in Korea, ongoing in the European Command, and is scheduled to be complete Army-wide in 2007. Upon completion, the Army ODS Reserve will only support Halon 1301. This is a reduction from the five products supported in 1995.

The Army is a world leader in the elimination of ODSs in the area of helicopter engine nacelle fire suppression and natural refrigerant development. The Program Executive Office, Aviation, in conjunction with PM Apache, PM Utility Helicopter, and PM Cargo Helicopter, continues efforts to qualify halon replacement using hydrofluorocarbon HFC-125 for aircraft nacelles. For new Army aircraft and life-extension programs that extend existing Army aircraft systems beyond 2030, a qualified halon alternative is needed to ensure that operational readiness is not compromised. The Army selected HFC-125 as the sole fire suppression agent. As part of contingency planning, the 46th Air Force Test Wing at Wright-Patterson Air Force Base is conducting qualification tests.

The Army continues to be a world leader in the development of "natural" refrigerant cooling. Carbon dioxide (CO_2) is expected to replace Class II ODSs in tactical air conditioning systems by 2010. In 2005, the U.S. Communications and Electronics Research, Development, and Engineering Center (CERDEC) successfully demonstrated an under-the-hood CO_2 air conditioner for the up-armored HMMWV (M1114). The CERDEC continues its efforts in the development of a CO_2 Environmental Control Unit (ECU) by providing cooler air more quickly (and in a smaller package) than ECUs currently fielded.

Navy

Prior to the early 1990s, Class I ODSs played a vital role in the mission-critical operations of virtually every ship and aircraft in the U.S. Naval Fleet. As a result of the phase-out of Class I ODSs, the Navy developed a comprehensive four-pronged approach to eliminate the use of Class I ODSs at facilities and in mission-critical weapon systems. This approach included conservation of existing supplies of Class I ODSs; establishment of a mission-critical reserve (stockpile) of Class I ODSs that would support the Fleet until individual systems were converted or retired from service; development of next-generation, ozone-friendly systems designed for new acquisition programs; and conversion of existing systems using Class I ODSs to environmentally preferable alternatives when technically and economically feasible. Since 1989, this comprehensive program plan has reduced the Navy's annual consumption of Class I ODSs by over 95 percent.

For shore facilities, Navy policy required the retrofit or replacement of air conditioning and refrigeration equipment that contained CFC refrigerants no later than December 2000, unless a waiver were in place. To date, the Navy has retrofitted or replaced nearly all of the 3,000 CFC-containing air conditioning and refrigeration systems at shore facilities. The few remaining units operate under temporary waivers and are either scheduled for replacement before 2010, or may operate until the end of their service life only if they can be supported by existing recycled CFC supplies. CFC procurement is not allowed after 2010. Navy policy also prohibits the refill of existing shore facility halon fire suppression systems in the event of discharge, thus meeting the E.O. 13148 phaseout goal in this area.

On mission-critical legacy weapons platforms, the Navy uses a combination of retrofit and end-of-life phaseout for Class I ODSs, thus balancing operational and environmental risks while still meeting the directives of E.O. 13148. For example, between 1993 and 2006, the Navy retrofitted over 1,100 shipboard CFC air conditioning and refrigeration systems to non-CFC refrigerants, and used CFC refrigerant recovered from these retrofits to support other mission-critical systems until the end of their useful life.

For new design weapons platforms, the Navy has shown leadership in developing and implementing safe, cost-effective, and environmentally preferable alternatives to Class I ODSs. For example, in the late 1990s, Navy F/A-18E/F and V-22 aircraft were the first aircraft in the world to fly with non-halon engine nacelle fire suppression systems. The Navy continues to lead the world in aviation halon replacements by installing non-halon systems in UH-1Y and AH-1Z helicopters, and is working on halon replacements for MH-60R/S and CH-53K helicopters. The Navy has also implemented several alternatives to halon on new construction ships, including environmentally benign water mist systems. In the area of refrigerants, new construction Navy ships now use high-efficiency non-CFC systems which are 20 to 35 percent more energy efficient than older CFC systems.

Marine Corps

The Marine Corps has completed implementation of ODS elimination initiatives at the installation level. With the exception of Marine Corps Base (MCB) Camp Butler, Japan, and MCB Hawaii, all Marine Corps installations have transitioned to non-ODS substitutes or technology. The waiver for MCB Camp Butler does not extend beyond December 31, 2010. All Marine Corps installations are expected to transition to non-ODS substitutes or technology by December 2010.

The Defense Reserve of ODSs maintained by the Defense Logistics Agency (DLA) continues to support mission-critical applications for specified Marine Corps weapon systems, such as the Amphibious Assault Vehicle, the Light Armored Vehicle, and the M1A1 Main Battle Tank. The Marine Corps is implementing a transition plan to upgrade fire suppression systems for the Light Armored Vehicle to non-ODS technology.

Air Force

In 1993, the Air Force adopted a centralized ODS management program to ensure the appropriate emphasis on the elimination of ODS usage as technically and economically feasible alternatives became available. Since 1993, the Air Force has invested approximately $500 million using this approach and has reduced its annual consumption of Class I ODSs by more than 96 percent.

In addition to emphasizing ODS elimination, the Air Force's centralized management program ensures the responsible use of ODSs in the few mission-critical applications that remain. This approach sustains mission capability while meeting environmental protection standards. In October 1999, the Air Force banned the purchase of Class I ODSs, and formally incorporated that ban into policy in 2004. The Air Force relies entirely on its existing stocks of Class I ODSs to support remaining needs. This implements the E.O. 13148 prohibition on federal agency ODS procurements six years ahead of schedule. The Air Force also ensures that all personnel are aware of the need to avoid unnecessary losses of Class I ODSs and to recover, reclaim, and reuse the Class I ODS stock. The Air Force maintains these strict controls in both peacetime and in combat situations, where Class I ODS consumption can increase.

The Air Force continues to monitor commercial technology development efforts and implement Class I ODS alternatives as they become available. For example, the Air Force has initiated a joint program with the Navy to select a commercially available alternative to the Halon 1211 used in 150-pound flightline fire extinguishers, which would eliminate the largest remaining Air Force ODS use. These fire-extinguishing systems have challenging performance requirements, as they function as first responder protection for aircraft and associated combat capability. In August 2005, the Air Force and Navy submitted a detailed proposal for the Environmental Security Technology Certification Program to fund this two-year alternative qualification effort. Approximately $800,000 has been approved for this project.

Most of the other remaining uses of Class I ODSs are in existing weapon and facility systems that included Class I ODSs in the original equipment designs. The Air Force has not retrofitted these systems with non-ODS alternatives because it has been unable to find alternatives that are technically and economically feasible. For these few remaining Air Force Class I ODS applications, the primary method of elimination will be through attrition—the retirement of these facility and weapon systems at the end of their useful lives and replacement with new design systems that do not use ODSs. For example, over the next two decades, the Air Force will replace over 2,000 F-15 and F-16 fighter aircraft, which use ODSs in integrated fire and explosion suppression systems, with the F-22 and F-35 aircraft, which have no ODS requirements. This approach is in accordance with E.O. 13148, which states an intent to "target cost-effective reduction of environmental risk by phasing out Class I ODS applications as the equipment using those substances reaches its expected service life."

DLA

DLA supports war-fighting readiness and preparedness through management of the DoD ODS Reserve, the only available source within DoD of Class I ODSs. Military uses for the ODSs include shipboard and submarine refrigeration; on-board aircraft, carrier deck and flightline fire protection; and armored vehicle explosion suppression.

DoD established the Reserve as an essential part of the Department's plan for phasing out the use of ODSs. The importance of this inventory has escalated since replacement of ODSs has proven to be more difficult than projected and

alternatives are not as available as expected. The Reserve provides DoD with the capability to recover and centrally receive, reclaim, and issue critical ODSs. To date, the military services have recovered and turned in approximately ten million pounds of product for reclamation. To enhance the recycling effort and better facilitate turn-in efforts, the Reserve has established overseas collection points at DLA distribution depots at Germersheim, Germany; Pearl Harbor, Hawaii; and Yokosuka, Japan. The recovery and reclamation process will continue for the life expectancy of the weapon systems being supported.

In support of environmental concerns within the European Union (EU), the DoD Reserve has established inventory within the bounds of the EU to support critical weapons systems requirements. Access to these inventories is through special request to the ODS Reserve Program Office. The primary operational site is located in Richmond, Virginia, with secondary reclamation operations located in the Netherlands and at Warner Robins Air Force Base, Georgia. In addition to storing ODSs in Richmond, there are secure long-term storage locations on the east and west coasts of the United States and in Australia.

The ODS Reserve has actively promoted federal recovery and recycling of ODSs and has initiated agreements with the U.S. Postal Service, Central Intelligence Agency, U.S. Customs Service, and other federal agencies for the recovery and reclamation of excess ODS stock. In 2006, the Reserve Program Office served as the lead to the U.S. Customs Service's development of a statement of work for a destruction contract for approximately 350,000 pounds of refrigerants that were brought illegally into the United States. The Reserve also provided technical oversight during the destruction process.

A comprehensive guide for safe decommissioning of nitrogen-charged halon systems that was developed under the direction of the Reserve is available on the Internet and is in use by commercial and government programs worldwide. The DoD ODS Reserve has become the model for reserve-type operations for governments and for domestic and foreign commercial activities.