Appendix P: Ozone-Depleting Substances

POLLUTION PREVENTION

Natural cycles constantly create and destroy stratospheric ozone. However, various ozone-depleting substances (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 can also lead to reduced crop yield and disruptions in the marine food chain. There are two types of ODSs. Class I ODSs have a higher ozone-depleting potential than Class II substances. 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 and methyl bromide to the list. When CFCs reach the stratosphere, the UV radiation from the sun causes them to break down and release chlorine atoms which react with ozone, starting chemical cycles of ozone destruction that deplete the ozone layer. One chlorine atom can break apart more than 100,000 ozone molecules. As methyl bromide and halons break down, they release bromine atoms, which are 40 times more destructive to ozone molecules than chlorine atoms.

Section 505 of Executive Order (E.O.) 13148, "Greening the Government Through Leadership in Environmental Management," establishes actions that federal agencies, including the Department of Defense (DoD), must take to reduce and manage the use of ODSs at federal facilities. These requirements include developing a plan to phase out acquisition of Class I ODSs by December 31, 2010. To measure progress towards reducing ODS usage, DoD requires that Components report the status of reduction plans.

Army

The Army remains committed to the elimination of Class I ODSs. Since 1992, the Army 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.

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 retrofit 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 retrofit or retired building fire suppression systems. All recovered halon is turned in to the Army ODS Reserve.

In Fiscal Year (FY) 2005, the Army implemented a new, aggressive ODS elimination policy that the Army Acquisition Executive issued on March 16, 2004. The policy 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 one 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 FY2005 and will be complete in FY2006. In FY2005, 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 to be complete in FY2012.

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 FY2007. When complete, the Army ODS Reserve will only support one product, 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 a 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. These tests are scheduled to be completed in FY2006.

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 FY2005, 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). 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

Navy policy required shore facilities to retrofit or replace air conditioning and refrigeration equipment that contained CFC refrigerants no later than December 2000 unless a waiver was in place. To date, the Navy 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 weapons platforms, Navy uses a combination of retrofit and end-of-life phase out for Class I ODSs, thus balancing operational and environmental risks while still meeting the directives of E.O. 13148. Between 1993 and 2005, the Navy retrofitted nearly 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.

Marine Corps

The Marine Corps 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 transitioned to non-ODS substitutes or non-ODS technology. The waiver for MCB Camp Butler does not extend beyond December 31, 2010. The waiver for MCB Hawaii does not extend beyond December 31, 2006. Although Marine Corps Air Station Cherry Point, North Carolina, was also granted a waiver until December 31, 2006, it is no longer needed because all of the equipment listed on the waiver has been retrofitted, and all of the Class I ODSs in the equipment have been recovered.

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 eliminate ODS usage requirements as technically and economically feasible alternatives became available. The Air Force ODS management program

includes the requirement that alternatives must not increase environmental, safety, or occupational health risks. This centralized management program also ensures the responsible use of ODSs in the few remaining mission-critical applications in order to support mission capability while meeting environmental protection standards.

Since 1993, the Air Force has invested approximately $500 million to reduce its annual consumption of Class I ODSs by more than 96 percent. Most of the 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 replacements. For the 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, in 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 the E.O. 13148 direction 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."

The Air Force continues to monitor commercial technology development efforts and implement Class I ODS alternatives as they become available. In FY2005, the Air Force initiated a joint program with the Navy to select a commercially available alternative to the Halon 1211 used in 150-pound flightline fire extinguishers. This would eliminate the largest remaining Air Force requirement for ODSs for which the Air Force has been unable to find a technically feasible replacement. As first responder protection for aircraft and associated combat capability, these fire-extinguishing systems have challenging performance requirements. 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. In October 1999, as part of its centralized ODS management program efforts to ensure responsible use of ODSs in the few remaining mission-critical military applications, the Air Force banned the purchase of Class I ODSs. Instead, the Air Force relies entirely on its existing stock of Class I ODSs to support remaining needs. The Air Force 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 ODSs in stock. The Air Force maintains these strict controls in both peacetime and in combat situations, where Class I ODS consumption can increase.

Defense Logistics Agency

The DLA manages the DoD Ozone-Depleting Substances Reserve, providing Components with mission-critical ODSs. The ODS Reserve only supports mission-critical weapons platforms. There are no acceptable ODS alternatives for many of the major weapon systems currently deployed. DoD established the Reserve as an essential part of the Department's plan for phasing out the use of ODSs. DLA provides central management of ODSs and provides DoD with the capability to receive, reclaim, and issue Class I CFCs and halons. Storing and handling the ODSs properly protects the environment and makes it possible for DoD to conserve and recycle ODSs, reducing the overall quantities required.

The ODS Reserve has agreements with other federal agencies for the recovery and reclamation of excess ODS stocks. Transfers of ODSs from other federal agencies have saved millions of dollars designated for purchase requirements and prevented poor handling and storage practices. The Reserve is a model for both foreign governments and commercial activities interested in ODS recovery and recycling.