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May 25, 2011

*To:* The Secretary of the Air Force *and*
Veterans of the C-123K Provider who Served Between 1972-1982

(OHSU logo added until letter arrives)

This letter is in regard to aircrews and maintenance personnel who, between 1972 and 1982, were assigned to C-123K Provider aircraft formerly operated in Viet Nam as Operation Ranch Hand Agent Orange spray aircraft. These aircraft were considered to be "heavily contaminated" with dioxins based on testing that was performed on C-123K Providers in 1983, 1994 and 2000. One of these planes, nicknamed "Patches", with tail number 362, has been partially restored and displayed in the air museum at Wright Patterson AFB, OH. Prior to its restoration, an environmental assessment was conducted on Patches in 1994 and dioxins were detected at an average interior surface concentration of 617 nanograms dioxin per square meter (ng/m2) (range of between 1400 ng/m2 and 200 ng/m2) and exterior surface contamination of 2.2 ng/m2 (range 4.1-0.3). Several congeners of dioxin were detected, each with varying degrees of toxicity; their levels were converted and reported as 2,3,7,8-TCDD equivalents, since 2,3,7,8-TCDD is the most toxic congener (see appendix 1).

I was contacted by former C-123K crew member Wesley T. Carter, Major USAF Retired, to answer the question: was he, as well as other Air Force personnel who flew, trained in and maintained C-123K aircraft, exposed to significant, excessive levels of dioxins during their assignments between 1972-1982? A direct and brief conclusion: Most likely.

To further answer this question, it can be assumed that the analytical results on samples taken from Patches are representative of all contaminated aircraft that were flown. It must be noted, however, that testing on Patches occurred more than ten years after decommissioning and more than 20 years after use in Operation Ranch Hand; therefore, surface dioxin contamination was likely higher during 1972-1982, where use and maintenance activities would have reduced surface contaminant levels over this period. Moreover, it must also be assumed that cabin air contamination, and thus inhalation exposure, would have been an additional significant source of dioxin exposure, although no analysis for air contamination was performed. It is notable in this regard, that John O. Harris, Lt. Colonel, USAFR Ret., stated, "Patches would smell of dioxin (Agent Orange) so badly that during the hot summer months we would have to fly with the cockpit windows open. During the winter months, when we turned on the heaters to warm the aircraft, the smell would be so bad we would have to fly with no heat" (see appendix 2). Without quantitative data on air dioxin levels, I will limit my

analysis to exposure from surface contamination, but will consider inhalation exposure from air contamination in my opinion, since this route of exposure would likely have been comparable, if not at least equally so, to dermal exposure from surface dioxin contamination.

In a memorandum regarding recommendations for protection of aircraft restoration personnel restoring Patches, dated 19 Dec, 1994, written by Air Force Staff Toxicologists Wade H. Weisman, Capt., USAF, BSC and Ronald C. Porter, GS-11, dioxin exposure guidelines were adopted based on guidelines developed by the state of New York in response to the infamous Binghamton State Office Building fire (see appendix 3). Re-entry concentrations, expressed as ng/m2 of surface area or ng/m3 air, are based on the EPA risk assessment paradigm from toxicity studies completed by the National Toxicology Program and validated by the Subcommittee on Dioxin, Committee on Toxicology in their 1988 report "Acceptable Levels of Dioxin Contamination in an Office Building Following a Transformer Fire" (1). The values for re-entry are 25 ng/m2 and 10 ng/m3 on surfaces and in air, respectively. At these levels of contamination, it is calculated that a 50 kg office worker working 250 days per year for 30 years would ingest 2 picograms per kilogram (pg/kg) dioxin per day for a cumulative lifetime ingestion of 750 ng. It is important to note that the air and surface contamination re-entry values are exclusive; exposure is to either air exclusively or surface contact. If both air contamination and surface contamination exist, then the safe re-entry level for each must be reduced (e.g. if air contamination is 5 ng/m3, then surface contamination can be no higher than 12.5 ng/ m2 in order to satisfy re-entry guidelines).

Using the guidelines cited above, it is calculated that surface contaminant levels inside the aircraft were approximately 25 times greater than exposure guidelines established by the state of New York. Therefore, the daily dioxin intake via dermal exposure would be calculated to be approximately 50 pg/kg body weight (0.05 ng/kg bw). At this level of exposure, it would take a 70 kg person 214 days to reach the lifetime ingestion limit of 750 ng dioxin. This calculation is conservative, inasmuch as the formula used by the state of New York to calculate the 2 pg/kg daily "safe" intake uses exposure parameters that would be typical of office workers in the office setting, whereas flight crews would be expected to have more intimate and varied contact with contaminated surfaces while conducting flight, maintenance and training activities. Moreover, inhalation must be considered an important exposure pathway. In contrast to the climate-controlled environment of an office building, aircraft are exposed to a variety of environmental extremes, such as heat, that would increase air dioxin concentrations. Without air contaminant data, no quantitative method exists to estimate the degree to which C-123K personnel were exposed via inhalation to dioxins. However, if one assumes that inhalation represents an exposure pathway

at least equal to that of the dermal pathway, then it would only take approximately 100 working days (800 work hours) to reach or exceed the recommended lifetime exposure limit of 750 ng.

C-123K crew members served for as many as ten years on this assignment. It would be impossible to quantify exactly how many hours each crew member spent within and around their aircraft. Total flight hours on contaminated aircraft can not account for the ground time spent on maintenance, training, sitting or sleeping on these planes. However, it is clear that thousands of hours of contact with contaminated aircraft are probable over a ten year period, particularly among the most experienced flight crew. Given the extent of dioxin contamination that was found, and based on the analysis above, it is my opinion that the personnel assigned to the C-123K Provider, particularly the most experienced crew, were more likely to as not to have been exposed to excessive levels of dioxins.

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Reference:

1. Doull, John, et al. 1988. Acceptable Levels of Dioxin Contamination in an Office Building Following a Transformer Fire. National Academy Press, Washington, D.C., 24pp.