

A Study of the Evaluation of the Effectiveness of Firefighter Clean Cab Decontamination Procedures

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Introduction and Objective

There are currently more than one million firefighters working in the United States. In this profession, firefighters are exposed to carcinogens while fighting fires, conducting overhaul activities, and from contacting the exteriors of self-contained breathing apparatuses (SCBA's) and protective gear. The National Institute for Occupational Health and Safety (NIOSH) found that firefighters are at increased risk to a number of cancers, particularly digestive and oral cancers (stec et al. 2018, LeMasters et al. 2006). The idea of the "clean cab concept" has become prevalent in fire department response and decontamination procedures in recent years. This concept focuses on minimizing the exposure to the interior of engine cabs to contaminants typically encountered fighting fires by keeping SCBA's out of the cab of the engine and storing those SCBA's in a separate cabinet behind the cab. This study will focus on the collection and evaluation of carcinogenic contaminants within the cabs of fire engines at two different fire protection districts that follow differing procedures on allowing SCBA's in the cab while on route to fires and will focus on evaluating the contamination reduction of current SCBA cleaning methods. The south Adams County Fire Department does not have clean cab engines and stores their SCBA's in the cab while the Westminster Fire Department has clean cab engines and stores SCBA's behind the cab.

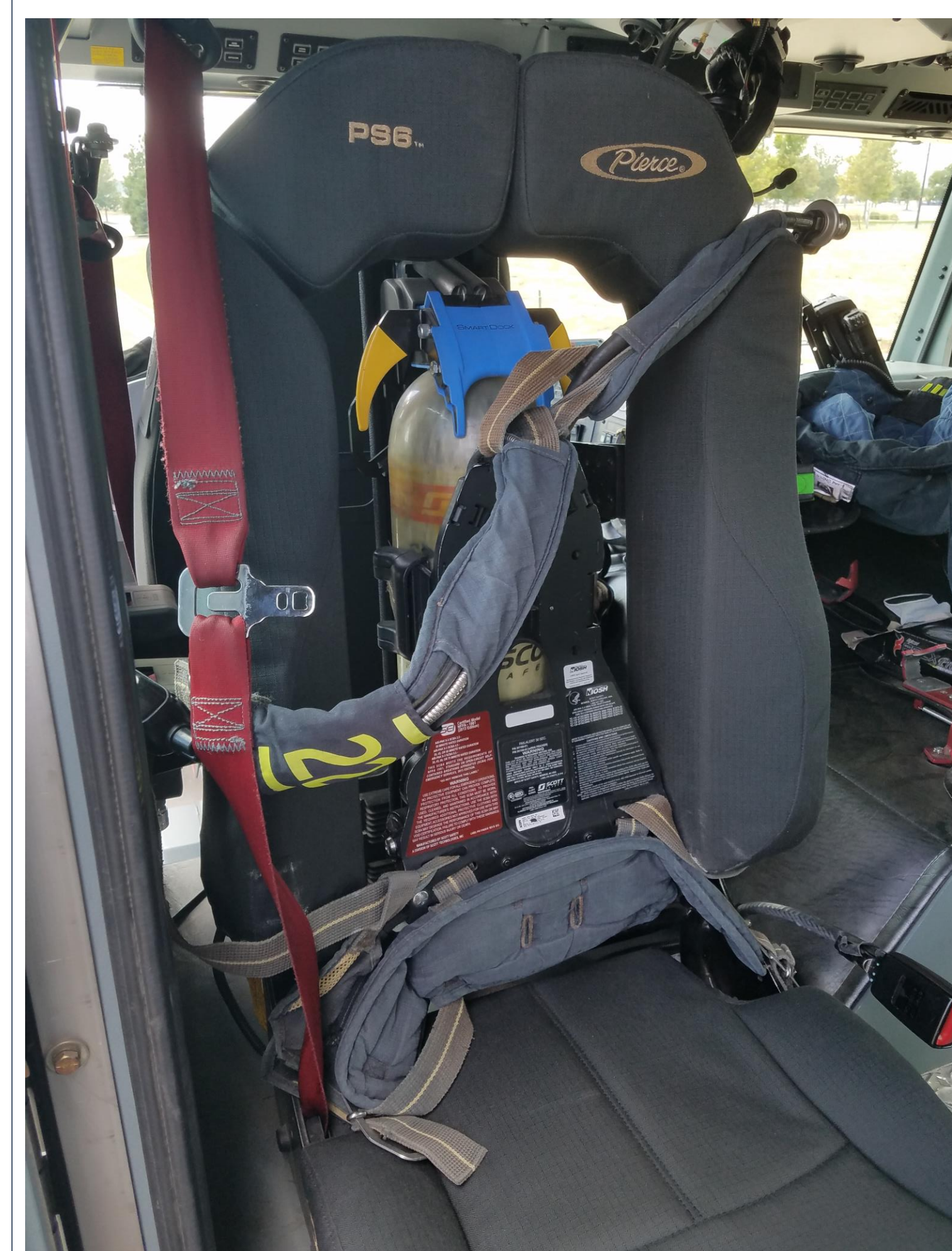
In order to determine the effectiveness of cleaning procedures, the objectives of this project were to:

1. Investigate the concentrations of contaminants on firefighter SCBA's before and after post-fire decontamination procedures.
2. Investigate the concentrations of contaminants inside fire engine cabs after a fire.
3. Compare the concentrations of polycyclic aromatic hydrocarbons (PAH's), Arsenic, Lead, and Cadmium on firefighter SCBA's before and after decontamination and compare the concentrations between fire engine cabs that are considered "clean cab" against fire engine cabs that are not considered "clean cab".

Methods

Process:

- Within 24 hours after a structure fire at the South Adams County Fire Department or at the Westminster Fire Department, researchers mobilize to the fire station involved in the structure fire. Westminster Fire Department uses clean cab engines and South Adams County Fire Department does not.
- Take 100 cm² surface wipe samples from the steering wheel and passenger rear door handle.
- Take 100 cm² from the rear of the SCBA air pack including part of the shoulder strap. One sample will be taken from a pack that was bagged at the scene of the fire and has not been fully decontaminated yet. The other will be taken from a cleaned pack that has been returned to service following the fire.
- PAH and metals wipe samples are taken separately and are stored in laboratory approved bottles.
- PAH wipe samples are sent to Bureau Veritas Laboratories and are analyzed by NIOSH method 5506 (modified for wipes).
- Metals samples are sent to Wisconsin Occupational Health Laboratory and are analyzed by NIOSH method 7303.



Non-clean cab engines store air packs on the seats inside of the cab. The air pack is decontaminated from the previous fire before being placed back into service in the engine. Clean cab engines store their air packs in a compartment behind the cab. Firefighters may be exposed to metals and PAH's from contact with their air packs while driving to and from the scene of an incident.



Air packs are stored in contractor bags following a fire and are sampled prior to full decontamination.



Steering wheels are sampled as they are a primary hand contact location within the engine cab.

Results

Samples have been taken from December 2019 – March 2020 so far. Currently all results are below the limit of detection for PAH's and for each of the metals sampled.

Future Sampling

The number of structure fires during the sampling campaign has been lower than predicted and incident reports show that the fires that were responded to were smaller in scale and possible contained fewer PAH containing materials than a typical structure fire which could lead to the low contaminant concentrations observed. All results obtained so far have been below the limit of detection for both PAH's and metals.

Due to COVID-19 pandemic, sampling has not been conducted since early March 2020. Researchers have modified sampling protocol for remaining samples. Researchers will attend three (3) separate class A training fires put on by the South Adams County Fire Department and the Westminster Fire Department. At class A training fires, normal household items are burned in the training building to simulate a normal structure fire. Wipe samples will be conducted on gear and cabs immediately post fire and then again after full decontamination. Multiple stations participate in the training fires meaning that more samples can be conducted during each event than before. Time becomes less of a concern as PAH semi-volatiles are still present and sampling will reflect actual post fire concentrations compared to 24 hours later.

Conclusions

The number of structure fires during the sampling campaign has been lower than predicted. All results obtained so far have been below the limit of detection for both PAH's and metals. At this time, researchers have not made any preliminary conclusions regarding the exposure differences between clean cab and non clean cab engines.

Acknowledgements

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