Research topic:

Industrial processes and products

DII research group
DECON/DEMIL

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Collaboration

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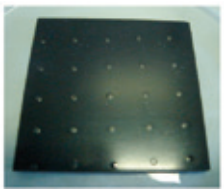
EFA (European Fighter Aircraft)

Main research topics:

- Technologies against threats posed by environmental events and trends to individuals, communities or nations.

CWA decontamination of EFA's materials

The EFA (European Fighter Aircraft), or Eurofighter Typhoon, is a four European nations twin-engine, multirole aircraft, designed and built by a consortium of three separate partner companies: Alenia Aeronautica, BAE Systems, and EADS working through a holding company Eurofighter GmbH. The aircraft has entered into service with the UK Royal Air Force, the German Luftwaffe, the Italian Air Force, the Spanish Air Force and the Austrian Air Force.
Concerning the operability of the aircraft in a CW environment, a joint commission of experts of the four partner countries, on the basis of chemical and physical properties, sorted all the metallic and non-metallic materials used in aircraft construction in four different lists, each one with different levels of chemical agents penetration resistance characteristics: 1. Poor, 2, Sufficient, 3. Good, and 4. Excellent.
The purpose of the research was the efficacy evaluation of the new decontamination concept, designed for "thorough decontamination" of "sensitive equipment", on ten different materials belonging to the list 2 (sufficient).
"Sensitive equipment" is generally difficult to decontaminate due to their construction characteristics, component materials, and location. Humidity and corrosive decontamination products may damage some of these materials.
Moreover, weaponized chemical and biological agents are designed to resist decontamination by penetrating the surfaces they touch.
The CBRN decontamination system has been developed with the purpose of satisfying the following objectives: ready-for-use system, active for different CBRN agents, as well as any other substance that may contain them, no liquid form in order to avoid spread of contamination, no chemical reaction on the surfaces except removal of agents, detoxification/disposal of the decon residue remotely, useable virtually on all surfaces (material/morphology) without causing damage, even after multiple application cycles, eco-friendly, suitable for military and civil application, long life span, easy to handle and store.
Ten different materials of group 2, commonly employed in the internal part of aircrafts, have been chosen by expert of the consortium.
Samples are square cut pieces of the previously reported materials (5×5 cm = 25 cm^2).
The contamination was performed to realize a HD concentration of 2g/m^2 (contamination 10 times higher than specific NATO Document, (0.2 g/m^2).
CBRN decontamination system is based on a multiphase aerosol system contained in a pressurized metal canister and ready to use. The decontamination procedure-employed in the laboratory was performed by the defined "decontamination cycle".



For the more sensitive materials the "liquid" drops of HD disappear leaving a swollen surface after only a few minutes from placing HD on the sample.
Figure Oil-resistant nitrile rubber (type 2001) after 1 minute from the contamination.

The results obtained can be used to show some fundamental aspects of the mechanism by which the CBRN decontamination system acts, helping to understand the effects influencing the decontamination process efficiency. For this purpose it would be useful to focus on the differences between the CBRN decontamination system decontamination yields and the solvent-wash ones.
CBRN decontamination system treatment gave a greater decontamination performance for all tested materials if compared with solvent-washing.
The greatest differences are related to the more sensitive materials that are the ones with less resistance to the HD penetration after 30 min of contact time.
A reasonable interpretation of these data is that the HD penetrated into the material is effectively extracted by CBRN decontamination system proving the high CBRN decontamination system extraction capability. The CBRN decontamination system capacities to extract the toxic from the more resistant materials, in which the chemical aliquot remaining over the surface is the most of the total contamination amount, are partially hidden by solvating process that is the primary process by which the toxic is removed. After all, the good solvent power shown by CBRN decontamination system in these cases, together with the concomitant extraction activity, that manages to remove the chemical residual traces not eliminated by the solvent action, achieves excellent decontamination yields.