Understanding Overpressure in the FAA Aersol Can Test with Halon Replacements[*†]

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INTRODUCTION

Because of its destruction of stratospheric ozone, the use of the effective fire suppressant CF_3Br (bromotrifluromethane, halon 1301) has been discontinued, with exceptions being certain critical applications such as the suppression of cargo-bay fires in aircraft. Recently, some halon replacement agents, including C_2HF_5 (pentafluoroethane, HFC-125), $C_3H_2F_3Br$ (bromotrifluoropropene, 2-BTP), and $C_6F_{12}O$ (1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone, Novec 1230), have been evaluated in a mandated Federal Aviation Administration (FAA) test: the Aerosol Can Test (FAA-ACT) in which a simulated explosion of an aerosol can, caused by a fire, must be suppressed by the agent. Unfortunately, unlike CF_3Br, the other agents, when added any concentration less than that required for inerting, created a higher over-pressure in the test chamber than with no agent added, and thus failed the test. Recent work has predicted the maximum overpressure with added agents and explored the overall rates of reaction of the inhibited system through stirred-reactor and premixed flame simulations. Laboratory-scale experiments are being developed for validation of the newly developed kinetic models, as well as for the screening of new agents. The results of these simulations and experiments will be presented, along with implications for cargo bay halon replacements.

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[†] Certain commercial equipment, instruments, and materials are identified in this paper to adequately specify the procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology.