



NRL RESPONSE TO NAS/NAE TRANSPORTATION RESEARCH BOARD STUDY OF SAFETY IN DOMESTIC OIL, GAS, & ETHANOL TRANSPORT (BY RAIL, PIPE, AND BARGE) – AERIAL FIREFIGHTING FOAM INQUIRY

1.0 INTRODUCTION:

This information paper has been prepared by the Naval Research Laboratory (NRL) to discuss the feasibility and options that may be available for dispensing Class B (flammable/combustible liquids) firefighting foaming agents when conducting aerial firefighting operations in response to a domestic oil, gas, or ethanol fire incident, which could occur in remote areas within the United States.

2.0 BACKGROUND:

The U.S. Forest Service (USFS) has employed aerial firefighting operations for many years to rapidly control and suppress wildfires. Aerial firefighting operations could include either fixed wing or rotary aircraft and the firefighting agents typically used include water, fire retardants, and Class A foams. The fire retardants known as “Slurry” can be applied either as a wet or dry mixture and is typically composed of salts found in fertilizers such as Ammonium Phosphate and Ammonium Sulfate. Class A foams are generally classified as a wetting agent, which lowers the surface tension of water to enhance fuel penetration and saturation of the burning Class A (combustible solids) fuels.

3.0 AFFF / AR-AFFF FOAMS AND APPLICABILITY FOR AERIAL FIREFIGHTING OPERATIONS:

Aqueous Film Forming Foam (AFFF) and Alcohol-Resistant Aqueous Film Forming Foam (AR-AFFF) firefighting agents helps to disrupt the combustion process by forming a physical barrier between the fuel surface and the fire and blocking the fuel vapor transport from the fuel into the flame. To achieve the desired physical/fuel diffusion barrier properties and extinguishment capabilities inherent in AFFF/AR-AFFF, the foaming agent application density (defined as the gallons of agent per unit area of fire size) and the level of foaming (foam quality) are critical factors for effective fire control and extinguishment. For aerial firefighting operations, the AFFF/AR-AFFF application density and foam qualities will be dependent on the aircraft’s forward speed and height from the ground, making this type of fire attack challenging, and would most likely require multiple air drops, in quick succession, to prevent burnback. In addition to the potential application challenges posed aerial firefighting operations, AFFF and AR-AFFF also present environmental and human health issues due to the presence of perfluorinated compounds (PFCs). Figures 1 and 2 presents some recent data related to groundwater contamination and the biological accumulation in human tissues associated with the PFCs typically present in AFFF formulations.

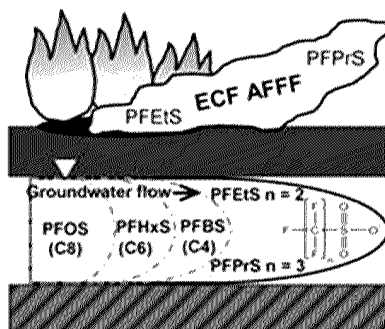


Fig. 1 – Barzen-Hansen, K., Field, J.A. “Discovery and Implications of C2 and C3 Perfluoroalkyl Sulfonates in AFFF and Groundwater,”
Environ. Sci. Technol. Lett., (2015), 2 (4), pp 95-99

