

Leadplane Training Lesson Plan

Retardant, Foam and Water Enhancers

12-09-N9065-HO

Objective:

To familiarize the student with retardant, foam, and water enhancers.

Content:

Review the following documentation on retardant, foam, and water enhancers as they relate to aviation operations.

Long-Term Retardants

Fact Sheet

What is a Long-Term Retardant?_Long-term retardants contain retardant salts - typically agricultural fertilizers – that alter the way the fire burns, decreases the fire intensity, and slows the advance of the fire, even after the water they originally contained has evaporated.

Long-term retardants are available as wet or dry concentrates that are mixed with water thereby improving water's effectiveness and ability to cling to fuels, over a long period of time.

All qualified long-term retardants are one-component products which means the color is a part of the concentrate. The concentrate, mixed with water, is ready to use.

Retardants may be colored with iron oxide (-R), fugitive pigment (-F), or remain uncolored (-W).

Iron oxide color remains visible until weathering removes it.

Fugitive color remains visible for several weeks or more until sunlight causes it to fade or weathering removes it.

Uncolored retardant may have a slight color due to the fertilizer base and/or other components, but it is generally not visible on the fuels.

Go to https://www.fs.fed.us/rm/fire/documents/qpl_ret.pdf for a list of qualified long-term retardants.

Water quality: Retardants are not generally affected by water quality i.e. hardness/softness, pH; however bacterial contamination of the mix water may, in some instances, reduce the viscosity of the mixed product.

Mixing outside of QPL listed mix ratios (either higher or lower): Concentrations lower than the approved concentration may not be effective. There is also an increased potential of corrosion, when the product is mixed outside the approved mix ratio.

Application:

Effective in both direct and indirect attack

These thickened products tend to cling to fuels due to their increased viscosity and may show reduced rate of evaporation over untreated water

All retardants are effective even after the water they contain has evaporated.

Training: Product coverage levels and observation times occurring during training and demonstrations often will not show the strengths of long-term retardants as coverage levels are frequently high and observation times low. Even fairly low coverage levels can remain effective after they dry and until they are removed from the fuel through weathering, rain, or other environmental factors.

Other considerations: Be aware of the potential for increased slipperiness on the ground or equipment where retardant was recently applied.

While retardant salts are fairly stable under a wide variety of water quality and contamination, the presence of retardant may have a significant effect on the performance of other fire chemicals.

Aircraft tanks and other equipment should be thoroughly rinsed before changing from one product type to another.

For more information on long-term retardants or program contacts, please visit our website: <https://www.fs.fed.us/rm/fire/wfcs/index.htm>

Class A Foam

Fact Sheet

What is a Class A Foam? A product that relies primarily on the water it contains for firefighting. These products contain foaming agents which create air bubbles when aerated and wetting agents which allow the fluid that drains from foam bubbles to be easily absorbed by fuel, soil, and other materials that it come into contact with.

Class A foams are one-component, wet concentrates that are mixed with water to improve the firefighting characteristics of water.

Go to https://www.fs.fed.us/rm/fire/documents/qpl_foam.pdf for a list of qualified Class A Foam products.

Water quality: Some products may be affected by water temperature or water quality, i.e. hardness/softness, pH. This may impact their foaming ability and longevity of the foam in particular.

Mixing outside of QPL listed mix ratios (either higher or lower): Mixing at higher mix ratios will not generally improve performance and MAY slow drain time while mixing at lower mix ratios may result in ineffective performance, such as lack of wetting. There is an increased potential for corrosion outside the approved mix ratio range.

Application:

Best in direct suppression efforts

Products are NOT effective when dry (water has evaporated)

Evaporation RATES are very similar to water; however, judging effectiveness by the presence of the foam bubbles may be misleading. The presence of bubbles suggests that the water remains entrapped in the bubble structure which may aid in keeping water on an inclined or vertical surface.

Assume a fairly short period of time, up to about 15 to 30 minutes of effectiveness in normal wildland conditions.

Class A Foams are approved for application from ground equipment and helicopter buckets. Some products also are approved for application from single-engine airtankers (SEATs) and/or fixed-tank helicopters. Some agencies may also apply foams from water-scooping aircraft.

Other considerations: Be aware of the potential degreasing action of Class A foams to aircraft and other equipment.

A heavy ground covering of foam may conceal hazards and increase the potential for tripping.

Class A foams may not be compatible with retardant salts, resulting in absence or poor quality and stability of bubbles.

Aircraft tanks and other equipment should be thoroughly rinsed before changing from one product to another.

For more information on Class A foams or program contacts, please visit our website:
<https://www.fs.fed.us/rm/fire/wfcs/index.htm>

Water Enhancers

Fact Sheet

What is a Water Enhancer? A product that relies primarily on the water it contains for firefighting.

These products contain polymers or other thickeners to improve performance; a) aid in adherence to fuels, b) allow build-up of thick, protective wet layer, and c) minimize drift during aerial application.

These products are available as wet or dry concentrates that are mixed with water to improve its firefighting characteristics.

Water enhancers may be uncolored (whitish), colored concentrates that maintain color when mixed with water, or an uncolored concentrate that is mixed with water that has a color added. Go to <https://www.fs.fed.us/rm/fire/wfcs/index.htm> for a list of qualified products (QPL).

Water quality: Many products are affected by water quality, i.e. hardness/softness, pH. This can result in drastic changes to the product's consistency (making it either thicker or thinner). Some products, under some conditions, take longer to thicken or become less stable in the container as well as after application.

"Freshening up" (or re-hydrating): Adding additional water to a mixed water enhancer to freshen the application may or may not actually work. The Forest Service has not quantified the increase/decrease in effectiveness. There is a higher likelihood of washing the product off the material you're trying to protect. After drying, the product will never return to its original, freshly-mixed consistency.

Mixing outside of QPL listed mix ratios (either higher or lower): There is an increased potential for intergranular (IGA) corrosion outside the approved mix ratio range. IGA has been found in some types of water enhancers and is an invisible type of corrosion taking place between the grains of a metal alloy, weakening it. Only mix ratios listed on the QPL have been tested specifically for intergranular corrosion.

Application:

Best in direct suppression efforts

Products are NOT effective when dry (water has evaporated)

Evaporation RATES are very similar to water. In field situations, water enhancers appear to last longer because of the thickness of the water layer on the fuel

Assume approximately 30 minutes to 1 hour of effectiveness in normal wildland conditions

Forest Service does not allow application of water enhancers by large airtankers Field users: Generally have better results in lighter fuels vs. heavier fuels

Demonstrations: Product thickness on fuels during ground demonstrations nearly always significantly exceeds anything possible with aurally delivered products.

Other considerations: Be aware of the potential for increased slipperiness on the ground or equipment, and/or difficulty cleaning aircraft, other equipment or surfaces exposed to water enhancers.

Because many water enhancers are not compatible with retardant salts and may not be compatible with other water enhancers, aircraft tanks and other equipment should be thoroughly rinsed before changing from one product to another.

For more information on water enhancers or program contacts, please visit our website: <https://www.fs.fed.us/rm/fire/wfcs/index.htm>

Completion Standards:

The lesson is complete when the student can demonstrate an understanding of retardant, foam, and water enhancers during the leadplane mission without the reliance on the evaluator.