Understanding Engine Use in Fire Program Analysis (FPA) Initial Response Simulation (IRS) Module IR_018_WP

Topic:

Understanding engine use in Fire Program Analysis (FPA) Initial Response Simulation (IRS) Module.

Purpose

This paper describes how IRS models engine behavior in order to simulate partial or full containment of a fire perimeter. IRS models behavior of engines with and without Water Tenders.

Terms

Fire Program Analysis System – A common interagency decision support tool for wildland fire planning and budgeting. This tool enables wildland fire managers in the five federal land management agencies to plan jointly. FPA also encourages the nonfederal wildland fire partners' participation.

Fire Workload Area Travel Time Point - A system-calculated point used to calculate travel time from a fire Dispatch Location to a Fire Workload Area (FWA).

Producer Type – The combination of Fire Resource Kind, Category, and Types split into Groups with similar attributes, such as Type 1 and Type 2 engines that are used primarily for structure protection.

Wet Rate – Fireline production rate applied when an engine is filled with water and/or is being supported by a Water Tender. FPA uses the Engine Initial Attack production rate in chains per hour, based upon the number specified in Daily Staffing, with water that is used for fireline construction.

Dry Rate – Fireline production rate applied when an engine is out of water and there is no Water Tender supporting it. IRS uses the Line Production Rates for Initial Action by Hand Crews in Chains per Person per Hour, multiplied by the number specified in Daily Staffing within FPA. IRS uses the dry rate for all Walk-in fires.

Preparedness Option – A combination of a prevention program and an initial response organization used in calculating the FPA performance measure for initial attack success rate. See Understanding the Fire Program Analysis (FPA) Prevention Module PR_014_WP for further information about prevention programs.

Background

Engine staffing, availability, and tank size define the fireline production capability of each engine type. IRS uses the National Wildland Fire Coordinating Group's (NWFCG) Initial Attack Fireline Production Rates to define wet and dry rates. The module calculates the wet fireline

production rate using the NWCG Initial Attack fireline production rates for the number of people on the engine, while the dry fireline production rate uses the NWCG Initial Attack rate for handcrews or individual firefighters. FPA uses the wet fireline production rates when the engine has water and is using it to construct fireline. The dry rate is used when the engine is out of water and the crew does construct fireline.

FPA has consolidated NWCG engine typing into producer types. Producer types are the combination of Fire Resource Kind, Category, and Types split into Groups with similar attributes, such as Type 1 and Type 2 engines that used primarily for structure protection.

Discussion

IRS uses engines in two different line-building capacities. The first line-building capacity is wet fireline production rates. Fire Planners define the wet fireline production rate by identifying how many gallons of water an engine's tank can hold, and the number of fire fighters assigned to that engine. An engine's tank capacity determines how long it can produce wet fireline at a steady rate of six gallons per minute. IRS calculates duration based on the tank size. The second line-building capacity is dry fireline production rates. Fire Planners typically use dry fireline production rates for Walk-in fires.

An FPU's Dispatch Logic may identify that an engine is required for Point Protection within a Fire Workload Area (FWA). When IRS dispatches an engine for Point Protection within an FWA, it is not building fireline and does not contribute to the containment effort.

When an available and dispatched Water Tender arrives at a fire event, FPA applies the wet fireline production rate for all engines working on the fire until either the fire is contained or it exceeds simulation limits. Water Tenders dispatched to a fire event support an unlimited number of engines, allowing their wet fireline production rate to continue. If an FPU wants or needs to model more than one Water Tender in order for the engines wet fireline production rate to continue, they need to be reflect this in the number of fire resources required for dispatching. IRS calculates an engine's wet production rate only for non-Walk-in fire events.

When engines respond to Walk-in fires, IRS applies a dry fireline production rate. The dry fireline production rate calculation uses the handcrew initial attack fireline production rate per person in chains per hour, multiplied by the number of people specified within FPA in Daily Staffing for each engine being modeled within FPA. Dry fireline production rate is used when an engine runs out of water and a Water Tender either is not available or has not been included in the Dispatch Logic. When the engine runs out of water, it departs to refill. During that time, the engine staffing minus one person (the engine operator) will be the number of firefighters constructing handline. In the instance that the Fire Planner has defined the staffing of an engine to be two people, then one remains on the fire and one is assumed to operate the engine.

Fire Planners use FPA to define:

- Engine availability by describing the Month, Day-to-Month, and Day that they plan to fund an engine as part of their Preparedness Option.
- The days of the week (within the availability period) that an engine is normally on duty.
- The typical hours-per-day that an engine can respond to a fire event without incurring a Callback Delay.

When a fire is discovered outside of the engine's typical hours-per-day, IRS applies a Callback Delay to an engine's fire Arrival Time when the Dispatch Logic identifies that an engine is available for dispatch. See Understanding Preproduction Delays in Fire Program Analysis (FPA) Initial Response Simulation (IRS) Module IR_005_WP for further information about delays.

Engines may work a maximum of 18-hours per shift, beginning when an engine starts its typical day, or is dispatched prior to its typical start time while incurring a Callback Delay. When the 18-hour shift ends, IRS stops that fire resource's fireline production to simulate a rest period. Fireline production may begin again on the following day at the typical engine start-of-day. If the fire resource is already working on a fire that has not been contained nor has exceeded simulation limits when the typical start time arrives the following day, IRS starts fireline production on the same fire the resource was working on when they reached the end of their 18-hour maximum time period. When the fire exceeds simulation limits during this time, IRS applies a Post Dispatch Delay Exceed Simulation Limits to the engine. See Understanding Delays in Fire Program Analysis (FPA) Initial Response Simulation (IRS) Module IR_009_WP for further information about Post Dispatch Delay Exceed Simulation Limits.

See Also

- Understanding Delays in Fire Program Analysis (FPA) Initial Response Simulation (IRS) Module IR_009_WP
- **(PENDING)** Understanding Airtanker Use in Fire Program Analysis (FPA) Initial Response Simulation (IRS) Module IR_015_WP
- Understanding Preproduction Delays in Fire Program Analysis (FPA) Initial Response Simulation (IRS) Module IR_005_WP
- Understanding Dozers, Tractor Plows, and Airboats in Fire Program Analysis (FPA) Initial Response Simulation (IRS) Module IR_019_WP