OAS-43A
(12/12)

Interagency Aviation Accident Prevention Bulletin

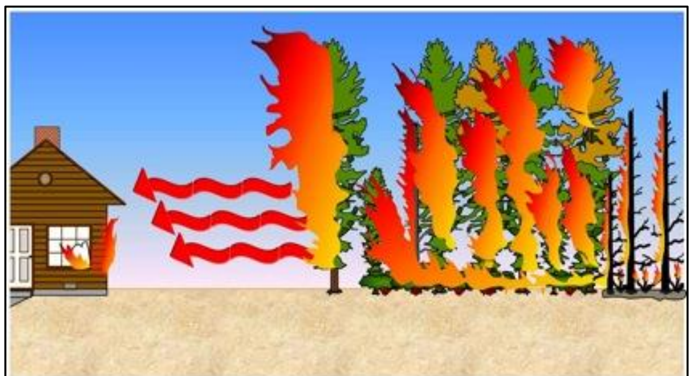
Subject: Radiant Heat in Wildland Fire Suppression Operations

Area of Concern: Flight Safety

Distribution: All Aviation Activities

Discussion: IAAPB 18-02 Smoke Column Hazards discussed the hazards associated with smoke columns in wildland fires. The APB briefly mentioned hot temperatures associated with smoke clouds and how it can affect aircraft performance to the point of damaging aircraft components but didn't address radiant heat generated from wildland fires and the unseen dangers they present.

Radiant heat is energy transferred through the air to other objects when materials burn. Burning objects release energy in the form of heat. You feel radiant heat when you stand near burning logs in a fireplace. In general, the size of the burning object determines the amount of radiant heat released, with larger fuels burning hotter. If a house receives enough radiant heat for a sufficient amount of time, it will ignite.



Campfires emit radiant "energy" in the visible and infrared spectrum, which upon interaction with your skin is felt as "radiant heat" without flames contacting it.

When sitting outside on a hot day, the feeling of "hot" comes from the radiant heat on your body from the sun being more than the heat emitted due to your internal temperature, so your temperature will increase.

An average surface fire on the floor of the terrain might produce flames reaching 1 meter in height and temperatures of 800°C (1,472° F) or more. Under extreme conditions, a fire can emanate 3050 kilowatts or more per foot of fire front. This would mean flame heights of 165 feet or more and flame temperatures exceeding 1200°C (2,192° F).

Wildfire flame fronts and convection columns contain superheated gases that can significantly reduce aircraft performance (and safety margin) while supporting fire suppression operations. Normal performance planning does not account for the drastic increase in density altitude associated with the increased temperatures. The following example illustrates how a 100° F rise in temperature can drastically affect density altitude:

	Original condition:	*New condition:*
Elevation:	7500 feet MSL	
Temperature: ↑	85° F	185° F
Altimeter:	29.85	
Dew Point:	50° F	
Density Altitude: ↑	11,036 feet MSL	16, 263 feet MSL

The resultant increase in density altitude produces hazardous conditions for helicopters and can lead to a loss of tail rotor effectiveness (LTE), settling with power, or decreased power available.

Managing your proximity to these hazards is crucial!

/s/ Keith Raley
Keith Raley
Chief, Aviation Safety, Training, Program
Evaluations and Quality Management
DOI, Office of Aviation Services

/s/ John K. Hamilton
J. Kent Hamilton
Branch Chief, Aviation
Safety Management Systems
USDA Forest Service