OAS-35A
(4/18)

Interagency Aviation Lessons Learned

Subject: Single Engine Air Tanker Operations

Area of Focus: Mission Profile

Distribution: All Fire and Aviation Operations

Discussion: Last fall, a Single Engine Tanker (SEAT) impacted the terrain after descending into a valley during an attempt to dispense retardant (tag and extend) adjacent to another drop. The drop location was at the bottom of an area surrounded by steep hills on both sides. The retardant was never dispensed, and the aircraft impacted the rising terrain as the pilot attempted to climb above it. This accident was investigated by the Office of Aviation Services (OAS) in conjunction with the National Transportation Safety Board (NTSB), the Federal Aviation Administration (FAA), and the Bureau of Land Management (BLM). Both contributing factors as well as present but not contributing factors of significance were identified. The NTSB has released a Preliminary Report: WPR20LA315

Drop Profile: The investigation benefited from eyewitness accounts and their cell phone video along with the aircraft Automatic Dependent Surveillance-Broadcast (ADS-B) data. The ADS-B data enabled a drone flight simulation covering the route of flight. On the accident drop, the video showed a clear view of the aircraft descending well below the tops of the ridges into the draw. The pilot was on the correct line and had called "gate armed." The pilot crossed the target ridge at approximately 15 feet above the top, continued to descend into the draw, and past the target area where the drop should have been initiated. For some unknown reason, the pilot never released any retardant. The aircraft was unable to meet the performance requirements and could not clear the ridge due to the delayed climb and the additional weight of retardant that remained on board.

It is conceivable that the pilot intended to make the drop well inside the draw at low altitude due to his deliberate descent into the draw. The arming switch for the gate was found in the "off" position. Although it is possible (but unlikely) that the switch was moved during the impact sequence, failing to arm the gate could have inhibited the pilot's ability to release his load with the pilot-controlled drop switch on the flight controls. All pilots should never place their aircraft in a position that depends on the

release of aerial delivered suppressants to clear terrain. It is also important for pilots to jettison their load whenever safety of flight is an issue. Careful planning of the aircraft's approach, speed, height, horizontal separations, and exit are essential – especially when operating in austere conditions.

Gate Operation: The aircraft was equipped with a Generation III gate in which there are three ways to release the retardant, including an emergency procedure. The first is using the drop switch on the control stick. This switch is only operational when the "armed" switch is in the "on" position. The second method is to push the manual salvo switch, which will drop the load regardless of the "armed" switch position. This is considered the first step of an Emergency Dump (E-Dump) procedure and the fastest method of releasing the load. Lastly, the E-Dump lever can be used to manually disengage the gate gearbox in the case of mechanical or electrical failure. This method requires additional time and pilot involvement in actuating the lever and is not ideal when pilot workload is high.

The manual salvo switch is a latching switch, meaning that if it is pushed, it will stay in the latched position until pressed again. Evidence suggests that the pilot did not attempt either a manual salvo release or an E-dump handle release of the retardant.

Witnesses observed the pilot performing operational E-dump system checks previously at the SEAT base as required in the contract, however the investigation team was unable to verify these checks since they were stored on the pilot's personal computer, which was not available to the investigation team. These operational checks should be documented and available for review by government personnel as specified by the Federal contract.

Data Vault: The Fire Retardant Dispersal System (FRDS) on board this aircraft has a device called a data vault that is able to record the fire-retardant gate operating condition and arming switch position on an SD card. The data vault was undamaged but failed to record the pilot's actions with the system. Examination by the NTSB laboratory revealed that the data vault failed to log information as the SD card was never properly configured. The data that should have been recorded would have provided critical, definitive evidence related to the gate operation and arming position switch condition.

Crew Resource Management (CRM) is the effective use of all available resources for flight crews to work toward a safe and efficient operation. CRM training focuses on the soft skills to combat human factor errors. Those skills include Decision Making, Assertiveness, Mission Analysis, Communication, Leadership, Adaptability/ Flexibility, and Situational Awareness.

In this situation, we must ask if communication could have been more effective. Could the pilot have communicated his intentions and his plan to drop on this fire prior to turning base to final? How will we approach our next engagement to ensure that we understand that the tactics are aligned with others and are appropriate? How can we, as pilots, mitigate rote behavioral traps such as saying "Gate Armed" instead of simultaneously visualizing and physically touching to verify that the gate is armed? Enhancing CRM among all those participating in the operation is key to developing a comprehensive system. Doing so will assist in preventing a catastrophic event resulting from a single lapse or string of latent errors that allow the holes of the swiss cheese to align.

ASHHE. The BLM has created a mnemonic device and flyer program to highlight and remind pilots and crews to ensure that they have made good choices when planning a retardant drop. ASHHE stands for: Approach, Speed, Horizontal Separation, Height, and Exit from the drop area. Some of these memory joggers are:

- Have I set up an approach that is clear of obstacles?
- Will my approach allow for deviation of my flight path if required?
- Will my approach allow me to maintain complete control of my aircraft?
- Have I set up an approach to allow me to not touch down prior to scoop area?
- Have I set up an approach that is appropriate for the drop area?

A	Approach
S	Speed
H	Horizontal separation
H	Height
E	Exit

- Have I set up an approach that aligns me with the target?
- Have I set up an approach that allows maximum time to visually acquire the target?
- Have I armed the retardant gate and verbally acknowledged?
- Have I viewed the previous drop and understand the tag-extend intent?
- Will my approach allow for a safe exit?
- Is my exit flight path free of obstacles?
- Is my exit corridor safe even if I have to retain the load?
- Is my exit visible during the drop sequence?
- Does my planned exit corridor require a radical change of direction or elevation?

There are considerably more thought-provoking reminders in the document and should be reviewed by all pilots and aircrews operating in these environments. The document is available at: https://www.nifc.gov/sites/default/files/blm/aviation/BLMsafety/Fodder_ASHEreview.pdf

The investigation also revealed that other pilots flew similar profiles that placed them in a position where releasing the load was the only way out. If you witness this type of activity, please notify your respective supervisors and follow-up by submitting a SAFECOM.

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