OAS-43A
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Interagency Aviation Accident Prevention Bulletin

Subject: Fire Boss Operations

Area of Concern: Scooping

Distribution: All Aviation Activities

Discussion: In 2003, Wipaire, a third generation family business in South St. Paul, Minnesota, put floats on an AT-802 and the Fire Boss was born. Today the Fire Boss can be equipped with thermal imaging units to accurately target hot spots, and a lighter fire gate that allows it to carry more water to each wildfire.

With the focus being direct attacks on fires, there's no doubt that the AT-802 Fire Boss has changed the strategy for fighting wildfires all over the world. It is a game-changer for the entire firefighting industry.

But with the success came challenges. Pilots for the Fire Boss come from a variety of sources including the military and agricultural spraying community with limited floatplane experience. Fire Boss missions can extend up to 4 continuous hours in a demanding low-level environment involving dozens of scooping cycles in one fuel cycle. Water sources may contain underwater obstacles not visible to the pilot that can change depending on a variety of factors. Arrival and departure paths from these uncontrolled areas can possess obstacles requiring careful performance planning to ensure avoidance. All of these hazards pose significant risks to both the pilot and the aircraft that must be addressed.

During the last 10 years, there have been 3 accidents and 3 Incidents-With-Potential (IWP) involving the Fire Boss within the DOI and USFS. Other incidents have occurred under various state operational control.

- 2012 (DOI, IWP) float strike on takeoff from scooping.
- 2017 (Washington Dept of Lands) wire strike on approach to scoop.
- 2017 (DOI, IWP) porpoising resulting in damage to the ventral fin.
- 2018 (Washington Dept of Lands /USFS contract, accident) engine failure during cruise flight.
- 2020 (DOI, accident) float strike on takeoff from scooping.
- 2020 (DOI, IWP) scooping abort.
- 2020 (DOI, accident) Uncommanded hard right turn on touchdown for scooping resulted in running ashore and impacting trees and vegetation.

The following are some tips on making each flight safe and successful.

Before the Mission

All pilots should be familiar with **I**llness, **M**edication, **S**tress, **A**lcohol, **F**atigue, **E**motion (IMSAFE). IMSAFE is the Aeronautical Information Manual's (AIM) recommended mnemonic for aircraft pilots to use to assess their fitness to fly. Operating in the current COVID-19 environment has introduced additional stress on everyone - pilots, crew, and managers.

Crew day & fatigue - Current contracts allow for 8 hours flight time per day and a 14-hour duty day. Continuous operations in the low-level environment (scooping and dropping) is strenuous and fatiguing. Fire Boss operations preclude any occasional rest that may be obtained from returning to the tanker base or helispot. Ultimately, this will adversely impact performance and decision making as the pilot is usually the last person to admit to being fatigued, especially during fire suppression operations. As a result, it's incumbent on aviation managers and supervisors to maintain awareness and develop mitigations to ensure mechanisms are in place to proactively address fatigue related issues.

Environmental factors - Altitude, temperature, and winds affect aircraft performance and its ability to perform the mission safely. Everyone knows that pre-mission planning is essential, but Fire Boss operations require additional considerations and continuous updating due to unique scooping and takeoff areas, changing conditions over time, and varying arrival and departure paths to accommodate changing environmental conditions. The environmental conditions for the ninth or tenth scoop of the day may be completely different from the first or second.

During the Mission

Scoop site selection. Current scooping profile charts are based on a no-wind, maximum gross weight takeoff after scooping with a 50-foot obstacle clearance on approach and departure from the water source. In an effort to stay close to the fire, some pilots may select a water source that fails to allow the aircraft to meet those performance requirements. Limiting the amount of water on each scoop is one method used to mitigate this issue but then the question remains – would it be safer and more efficient to select a different water source farther away that was more compatible with performance requirements and allow more water to transported safely? Fire Boss operators don't enjoy the luxury of surveyed departure and arrival paths provided at developed airfields so it's entirely up to them to determine the amount of water that can be scooped without hitting the terrain (or other obstacles such as power lines) on takeoff. When considering a scoop site location, it may also be necessary to consider if it's suitable for multiple aircraft to operate simultaneously, providing plenty of room to maneuver without interference with each other including wake from other scooping aircraft or other watercraft.

High and low reconnaissance. Conducting a high and low reconnaissance is essential in determining that the water source is clear of debris and other hazards. But as mentioned earlier, some obstacles may not be visible to the pilot and conditions can be constantly changing – especially in rivers. Low passes that mimic the arrival and departure paths are essential in order to properly assess both water condition and aircraft performance. Reassessing these areas will be required throughout the day as conditions change.

Emergency Procedures – go/no-go point. Planning and knowing when to abort a scoop is more important in Fire Boss operations than in most other aircraft due to the many dynamic factors inherent to its operation. Very few other aircraft are changing weight while operating on a moving runway. Pre-determined decision points and decisive action will be the difference between success and failure. Go-arounds and jettisoning loads should be within the acceptable realm of any pilot's authority.

Continuation bias and delayed decision making have resulted in very undesirable outcomes. Fire Boss pilots must be aware of all environmental conditions and the impact of any change in those conditions may impose on their operation.

The decision to abort the scoop or jettison the load must be made without any hesitation for the following reasons: (1) Terrain or lake size may restrict the ability of the loaded aircraft to climb off the water and clear the terrain/trees/wires. (2) Fire Boss Wipaire floats do NOT possess sufficient flotation to float a fully-loaded Fire Boss on the water if the pilot were to pull the power back and come off the step without jettisoning the load. The pilot MUST jettison the load before coming "off the step" on water. (3) Pilots must also be prepared to jettison their load in any situation where climb performance must be improved.

Another item unique to the Fire Boss mission involves aerial supervision. The majority of the 802 operations are retardant delivery but the unique nature of the Fire Boss places them in a more typical rotory wing water delivery / suppression tactic instead of retardant line building. Dip sites / on & off / rotory wing vs. fixed wing frequency management / speed & separation management, all add to the complexity of the Fire Boss mission.

Human Factors

Experience – Total flight time versus time in the Fire Boss. Most Fire Boss pilots could be considered experienced pilots overall, with experience gained from military, corporate and agriculture spraying operations. However, since this platform is relatively new to the U.S., most pilots are relatively new to the aircraft. A comparison of all pilots with less than 6,000 hours with pilots possessing over 10,000 hours yielded about the same number of mishaps which was much higher than the group possessing about 8,000 hours. The number of mishaps increased as the experience decreased at approximately the same rate as the experienced increased. The Fire Boss has the potential to combine both undesirable characteristics with highly experienced pilots in other aircraft with their inexperience in the Fire Boss.

Complacency - Complacency arises when one becomes very familiar with the work being done and it becomes repetitive and monotonous, such as dropping on a fire and then scooping in a nearby lake. Ten, twenty, fifty scoops can become monotonous and result in complacency. One pilot reported over 100 scoops in one day! Again, Fire Boss operations are more exposed to this hazard due to its unique operating capabilities.

Skill based errors – Minimum float time. Most Fire Boss pilots start out flying the AT-802 with wheels in either the agricultural or SEAT communities resulting in a lack of float plane experience. This requires a programmatic approach to build experience and develop the necessary skills without being pushed beyond their current capabilities. At the same time, a structured approach to advancing personal skills and capability is required to meet mission demands with the full capabilities the Fire Boss is able to provide.

Decision making – A sense of urgency often leads to hurrying and taking shortcuts. Being a professional pilot means that you can carefully evaluate information and make decisions absent emotional influence. Decision making is best when we can evaluate facts and perform analysis without the inherent emotion associated with urgency. Fire Boss aircraft possess a unique blend of capabilities and the demand for such resources may outstrip supply thus increasing demand and …you guessed it…urgency.

Task saturation often occurs in fire suppression operations and can be compounded with radio traffic. Compartmentalization, especially during scooping and dropping, aids in maintaining focus. Other items can be addressed when more critical functions have been accomplished.

In summary, the Fire Boss is an aircraft that brings a unique set of capabilities that will help accomplish our mission. With that, the dynamic environment in which it operates, and associated capabilities also bring many challenges that need to be addressed. Fire Boss operators need to be set up for success in every aspect spanning from the management of training programs to fatigue management. Implementing risk-based decision making through careful examination of the aforementioned areas will help us improve the safety and efficiency this unique type of aircraft by removing as much uncertainty and "guess work" as possible.

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