



Interagency Aviation Lessons Learned



No. IALL 17-02

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Subject: Red Dragon Plastic Sphere Dispenser (PSD)

Area of Concern: Prescribed Aerial Ignition Flight Safety

Distribution: All Aerial Ignition Operations

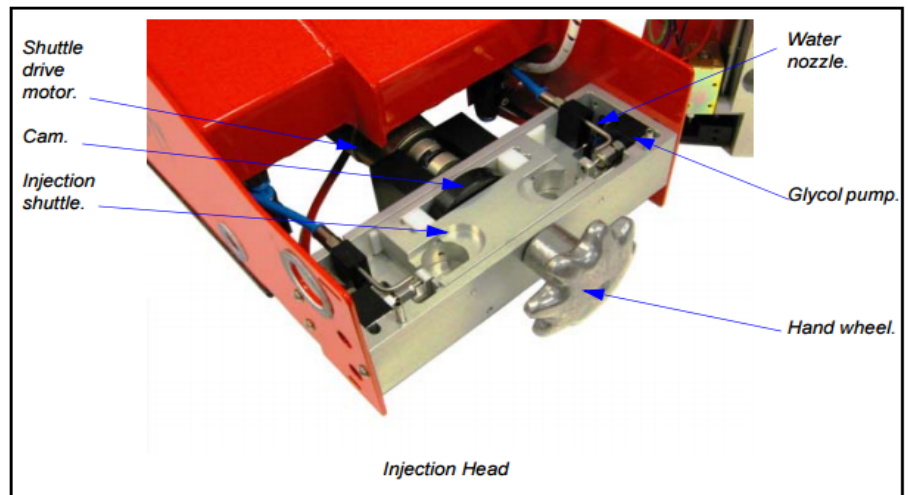
Discussion: The following describes two separate incidents involving the Red Dragon Plastic Sphere Dispenser. Part 1 deals with equipment inspection and maintenance. Part 2 concerns malformed PSD spheres.

Part 1. During the first flight of the day with the Red Dragon PSD machine, the PSD operator noticed that the manual hand wheel was sticking out further than normal (Figure 1). The PSD operator asked other PSD operators if they had encountered the same situation. None of them knew why the hand wheel was in that condition. During the second mission, a different PSD operator observed the manual hand wheel separate and fall from the machine after being airborne for approximately 30 minutes (Figure 2). The mission was completed despite the missing manual hand wheel ([SAFECOM 16-0131](#)).

Figure 1



Figure 2



The Red Dragon dispenser injects a measured amount of ethylene glycol into “Dragon Eggs” (which initiates a timed exothermic reaction) and then expels the primed spheres from the aircraft. The machine is equipped with an automatic system to detect and clear sphere jams in the shuttle. However, should the automatic system fail to clear a jam, or the unit lose electrical power, a hand wheel is fitted to the outboard end of the drive shaft. This hand wheel can be used to turn the drive motor and cam in either direction to clear a jammed or broken sphere. This handle is critical to performing the emergency procedures to clear the machine during a malfunction as stated in the Red Dragon service manual (February 2015 version C) section 3, Emergency Procedures (page 29).

To check the hand wheel prior to use, Section 6, Maintenance and Service states: Rotate the hand wheel to check the drive system for smooth operation.



Lessons Learned: Always check your equipment **before** using it. **If something doesn't look right, check it out. Do not fly if the equipment is not functioning properly.** Do not perform aerial ignition operations without the manual hand wheel as that will significantly inhibit your ability to perform the clearing procedure in a situation where you may need it most. Additionally, loose objects that fall from a helicopter can be catastrophic.

Part 2. Warped PSD Dragon Egg spheres were becoming jammed inside the feeder chutes on multiple Red Dragon PSD machines ([SAFECOM 17-0246](#)). The chute's tight tolerance caused warped spheres to become stuck above the slipper block. Of the 8,000 to 10,000 spheres that were hand inspected, approximately 150 were warped enough to prevent them from traveling through the chutes. These spheres were from boxes marked with the dates Oct 1, 2015 and Sept 9, 2015. The boxes had not been damaged or handled roughly and had been in safe storage since delivery. [SAFECOM 16-0242](#) describes another instance of malformed PSD spheres jamming in the machine.

Lessons Learned: PSD sphere quality has been an issue over the years. Pre-inspecting spheres for anomalies and foreign debris, actively monitoring the equipment, and contingency planning for an unexpected occurrence are your best mitigations. Should you find any anomalies with PSD spheres, discontinue their use and notify your management and Aerial Ignition representative immediately.

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