

Release Altitudes of Fire Extinguishing Agents

Presenter: To Be Determined

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Data from multiple sources was analyzed to determine where in the air column engine/APU fire extinguishing discharges occur. These discharges can be driven by both real and false fires, and by other operational events, such as maintenance errors or individual operator procedures requiring discharges during events such as emergency evacuations. Careful review of logbook data can also reveal the frequency of leaking bottles and pressure relief events.

Understanding the typical altitudes and operating (or non-operating) conditions of in-service events can inform design philosophies, regulatory focus, and emphasis on factors such as environmental impact of agents with varied altitudes of release.

Official incident reports show a strong tendency towards releases at low altitudes, typically during engine or APU start, engine accelerations for takeoff or go-around, or upon application of reverse thrust. All of these conditions are coincident with a sudden rise in internal temperatures, pressures, and vibration levels, and would be expected to drive failures. Very few events happen in cruise, upon application of climb thrust, or during deceleration, such as top of descent.

The addition of non-operational events culled from airplane logbooks shows additional ground level agent releases, and some unusual conditions such as repeated thermal discharges in hot environments. The overall indication is that release of extinguishing agent by engine/APU fire extinguishing systems on commercial transports is heavily weighted towards the 10,000 feet just above ground level.