

22 March 2006

*The following was submitted shortly after 11 September 2001 by an AirSafe.com visitor and airline captain who is concerned about possible chemical and biological attacks on airliners. The following article contains suggested in-flight procedures for dealing with threats posed by an actual or potential attack using chemical or biological agents. The following implied procedures are not approved by any government organization or by any airline, and represents only an attempt at starting a discussion among airline flight crews, safety professionals, and government regulators about what procedures should be used.*

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### **Dealing With Chemical/Biological Weapons During Flight: What The Flight Operations Manual Doesn't (Currently) Tell You**

You're comfortably cruising at 35,000 feet when suddenly you receive information that a possible chemical or biological weapon threatens your flight. Now what do you do? According to aviation security experts, the risk of a chemical/biological weapon being used on an attack against a commercial airliner is real and increasing.

These popularly called "weapons of mass destruction" include a medley of solutions and agents designed to cause fatal paralysis, suffocation, blisters or infection. Compared to a nuclear device, Chemical/Biological Weapons (CBW) are relatively inexpensive, simple to produce, and if properly designed, employable. In other words, chemical weapons are proven, viable weapons suitable for use by terrorist organizations seeking to make a mark on world affairs. Able to fit into small containers or pieces of luggage, a CBW device could be smuggled aboard an airplane via carry-on luggage or checked baggage.

With this in mind, besides contacting the SOC (System Operations Control), what would you do if confronted in flight with a valid report of a CBW threat to your airplane, passengers and crew? How is this situation different from that of dealing with a classic bomb threat to your flight?

#### **Aerosol CBW Activation**

First a brief explanation of how CBW agents would probably be dispersed inside your aircraft: simple aerosol dispersion. It is the primary means of spreading the substance through simple airborne transmission onto the skin or into the eyes, lungs and nasal passages using the medium of the cabin atmosphere. Although you've heard the comment of "one drop of nerve gas on your skin will kill you," realistically no one will be dripping a solution onto your skin with an eyedropper. Instead it will be introduced by an aerosol transmission made possible by either exploding the contents or through controlled leakage from whatever container holds the deadly composition.

With an understanding of the weapon's likely dispersal characteristics, it will be our goal as crewmembers to contain the weapon's aerosol potential before it spreads through the cabin atmosphere, or if unable, to minimize its affect on our passengers and crew.

While the FOM (Flight Operations Manual) provides useful information on how deal with explosive devices on board an aircraft, however a CBW risk must be dealt with in a relatively different manner. As an example, the idea of moving a suspect bomb to the "least risk" location on an aircraft is a great idea, but moving a suspected CBW device would be ill advised. CBWs, because of their very nature, must be dealt with in a separate, unique manner that is different from explosives.

Dealing with a reported CBW threat requires a thought out plan, good cockpit resource management, and full participation of both cockpit and cabin crew. Determining the location, identification of the suspected device and appropriate reaction to the threat requires calm thinking, clear communication and a cautious, timely response.

All crewmembers must be involved, but it is important to separate responsibilities between the cockpit and cabin. The cockpit crew must focus on flying the aircraft, managing the cabin temperature, pressurization and other systems while coordinating with assisting agencies. The flight attendant staff, on the other hand, should prepare and deal with any suspected CBW device located within the cabin while executing appropriate emergency prelanding activities.

The location and status of a CBW weapon will require different crew reactions. The specific threat situation and response must be separated into categories of location--cabin versus cargo area-and condition—unactivated versus activated weapon.

### **Cabin Threats Without Activation**

If a CBW is reported on the aircraft (but without apparent activation due to lack of symptoms), the crew must take immediate steps to deal with the situation and attempt to minimize aerosol dispersion immediately. Cockpit and cabin crewmembers have different duties that should be started simultaneously.

Cockpit crewmembers should immediately don masks, goggles, select 100% oxygen, maximize skin coverage with shirtsleeves down or uniform jackets worn. Although an emergency declaration and turn towards a diversion airport is appropriate, an immediate change in altitude-make that, cabin pressure change--should not be initiated until the unactivated device is secured to the maximum extent possible. Immediately reducing cabin temperature to the lowest practical setting, however, will decrease most aerosol dispersion characteristics, and this step should be taken immediately.

Cabin crewmembers should also don uniform jackets and prepare to seek out the suspected device. Moistened paper towels can be used as jury-rigged breathing filters for passengers (surprisingly, they actually help filter certain gases) and should be provided as time permits. If the CBW device is reported to be in a specific piece of luggage or location, the cabin crew should identify the device without moving or touching it. Once the device is identified, all passengers should be removed from the immediate area while steps are taken to isolate and seal the weapon as much as possible. Cabin

crewmembers should prepare for isolating the device by covering all exposed skin, and donning rubber gloves and personal breathing equipment.

### **Securing a Suspected CBW Weapon**

Blocking the weapon's ability to disperse chemicals in the cabin is of paramount importance. Remove all items surrounding the container/luggage holding the suspected CBW, but DO NOT move the suspected device! Instead, cover and seal the device as much as possible with a layer of plastic trash bags, dry blankets, more plastic, wet blankets, and then more dry blankets. Create as many barrier layers as possible between the agent and the cabin atmosphere. Remember: the primary goal is keeping the chemical contained and out of the cabin atmosphere.

Once the suspected CBW container is covered and sealed from the cabin atmosphere, a gradual descent of the aircraft can be initiated using a descent that minimizes the rate of cabin change. The slower the descent and increase in cabin pressure, the lower the risk of agent dispersal during the final phase of flight.

Upon landing and taxiing to the airport min-risk location, park diagonal to the surface winds to minimize passenger risk of contamination while deplaning through aircraft upwind exits. Even if there appears to be no manifestation of possible CBW contamination, passengers and crew should remain together and quarantined until checked by trained personnel.

### **Cabin Threats With Activation**

Unexpected exposure to an activated chemical-biological weapon within the confines of an aircraft cabin is one of the worst possible situations imaginable. Survival will require quick identification, clear thinking and swift response.

With the exception of slow-acting agents such as Anthrax, airborne exposure will rapidly generate sudden passenger sickness in an epidemic outbreak. Depending on the agent, passengers and cabin crew may exhibit choking, discoloration and fainting, blistering or convulsive actions that are beyond the means of crewmembers to deal with effectively while airborne.

When this situation is reported to the cockpit crew, immediate actions must be taken: cockpit crewmembers must don mask and goggles, secure the cabin door and deny any entry from the cabin. Next, decrease cabin pressure (by raising the cabin altitude) as quickly as possible--and as much as possible--to evacuate and dilute the aerosol chemical agent. Additionally, select the coldest possible temperature to aid in minimizing agent aerosol dispersion.

A rapid descent and diversion to a suitable airport is of critical importance. An immediate landing is paramount to ensure cockpit crewmembers are physically able to land the aircraft, and gain time-critical medical treatment for exposed individuals. Fear of contaminating large populated areas should not interfere with the decision to land at a major airport, as chemical agents are generally of a short-term nature and will dissipate rapidly. Get the airplane on the ground while you can!

### **Cargo Compartment Threats**

A reported CBW threat in a cargo compartment should be dealt with much as one would deal with a cargo fire. Isolate the cargo bay by removing all sources of ventilation and shut off cargo heat

sources. This process will significantly restrict agent dispersion and protect the passenger cabin.

In-flight activation of a CBW weapon may be sensed by smoke detectors in the cargo hold. Illumination of warning lights will not distinguish whether the smoke is from a weapon or cargo fire, but normal fire-fighting techniques will accomplish optimal protection while airborne.

During descent, a positive outflow of pressure from the packs will decrease the risk of chemical agents migrating from the cargo bays and into the cabin. To sustain this protection until a planned deplaning, setting the landing elevation somewhat lower than the actual destination will keep the cabin relatively over pressurized throughout the landing process. Depending on the aircraft, time and system knowledge, manually keeping outflow valves from fully opening upon landing could keep the cabin over pressurized and protected from cargo area contamination until ready for emergency evacuation through upwind exits.

### **Diverting and Deplaning:**

Hopefully you will coordinate through air traffic control and the SOC to land at an diversionary airfield having explosive, CBW and medical expertise waiting to assist you with deplaning, and if necessary, decontamination. Coordinating your actions with local emergency response agencies to the maximum extent possible is critical. Although you are sitting on the fuse of a potentially deadly threat, it is also a weapon of risk to those outside your aircraft.

If confusion and miscommunication reigns outside the cockpit, you can accomplish certain actions on your own to minimize the risk to the airport and surrounding communities. First, try to avoid overflight of populated areas during the approach and landing. Second, after landing do not taxi to a terminal, but instead seek a location downwind of any populated structures. Third, park diagonal to reported winds to allow deplaning only on the upwind side of the aircraft. Finally, keep all passengers and crew together and quarantined from non-emergency personnel.

### **Conclusions**

No general article on the complex subject of dealing with chemical-biological weapons in-flight can provide the information and techniques appropriate for each specific aircraft-and it is certainly not the intention of this writer to suggest otherwise. The sole purpose of this writing is to get you, the crewmember, to consider in advance how you would deal with a genuine CBW threat in your airplane.

Events of the past clearly demonstrate that the unexpected and unthinkable should be expected--and planned for accordingly. The risk of encountering a Chemical-Biological Weapon on your flight is unlikely, but possible. With a bit of thinking about the possibility, and preplanning a response, a CBW attack is survivable.

**About the Author**

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**About The AirSafe.com Foundation**

The AirSafe.com is a tax-exempt, 501(c)(3) educational charity that provides the aviation safety community and the general public with factual and timely information on issues and events related to airline safety and aviation security.

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<http://airsafe.com/issues/medical/chembio.htm>

Advice for travel under increased hijack threats

<http://airsafe.com/events/war/safetips.htm>

Information on the hijackings of 11 September 2001

<http://airsafe.com/events/nydc.htm>

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**Celebrity Plane Crashes** – [celebrity.airsafe.org](http://celebrity.airsafe.org) - This is AirSafe.com's collection selected crash videos from around the world, including crashes from airlines, military units, and private aircraft.

**Fear of Flying Resources** – [fear.airsafe.org](http://fear.airsafe.org) - Basic background information about fear of flying and suggestions about how a passenger can deal with the fear.

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<http://www.airsafe.com/downloads/pati.pdf>

**AirSafe.com Podcasting Manual** – This step-by-step guide gives any organization, from a middle school to corporations, the foundation to create an audio or video podcast, put that podcast on iTunes, YouTube and elsewhere, and to do so without spending much money.  
<http://www.airsafe.com/classes/airsafe-podcasting-manual-draft.pdf>

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