

SAFETY SENSE

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In 1980, a Lockheed L-1011 operated by Saudi Arabian Airlines suffered an in-flight fire and returned to the departure airport Riyadh. The aircraft landed, rolled to the end of the runway and stopped on the taxiway. The crew did not start an evacuation. The Aircraft Rescue and Fire Fighting (ARFF) personnel did not enter the aircraft as the engines were still running. After engine shutdown they watched from the outside as the fire spread inside the aircraft. According to the accident investigation report a lack of training and appropriate equipment prevented the ARFF crews from taking any action.

The crew inside the burning cabin were not able to initiate an evacuation. All passengers and crew perished in the fire. Accident investigators concluded that the crew were overcome by toxic fumes and were no longer in a position to initiate an evacuation once the aircraft came to a halt. The accident report by the Presidency of Civil Aviation reads 'The inhalation of toxic gasses, at times, is insidious and causes physical and mental impairment which would be alleviated by the proper use of oxygen.' Luckily the lessons were learned and since 1980 many things have changed.

Mastering Rare Events

Aircraft evacuations are extremely rare events. When crew members encounter an evacuation it will most likely be the first and only time in their professional careers. Therefore crew members do not have the benefit of learning from own experience. To prepare for evacuations crew members study lessons learnt from past evacuations and undergo simulation training.

For crew members the lessons learnt from numerous accidents and incidents have led to more sophisticated training programs. Procedures for evacuation preparation have been refined. Flight crews regularly practice simulated evacuations from the actual aircraft or from mock-ups. CRM training emphasizes the importance of communication to achieve a coordinated team action in case of emergencies.

LATE

Poor training meant that crew on Lockheed-L1011 delayed an evacuation

RESCUE AND EVACUATION



Planning Evacuations

Data from the NTSB suggests that preparing an evacuation significantly improves the survival chances of the occupants and limits the number of injuries sustained. Checklists for evacuation preparation are a valuable tool for crew members. Preparing the cabin for evacuation should include such items as reminding passengers of exit locations and explaining the operation of emergency exits, demonstrating and practicing the brace-for-impact position, re-seating passengers closer to emergency exits, removing sharp objects and high-heeled shoes, reviewing evacuation orders and reminding passengers to leave their carry-on luggage behind. Since time is often limited the preparation must be in order of priority. Many operators have two evacuation preparation checklists: a short version (less than 10 to 15 minutes) and a longer version.

Communications

The lack of communication between the flight crew of the Saudi L-1011 and ARFF personnel posed a significant problem. The ARFF personnel were not equipped to communicate on VHF frequencies and tried unsuccessfully to relay their messages through the tower controller, who in turn tried to contact the flight crew without success.

As a result of numerous safety recommendations ARFF personnel at many aerodromes today have VHF radios working on aviation frequencies. In addition, many aerodromes have published discrete emergency frequencies to improve communication between flight crews and ARFF personnel. A thorough flight preparation would identify such frequencies and add them to the crew briefing.

When You Least Expect Them

Most evacuations occur without preparation. They are the result of emergencies that arise unexpectedly. The most common causes for evacuations are engine fires, cargo smoke warnings and APU fires. Unplanned evacuations are more challenging than planned evacuations.

In 2005, an Air France Airbus 340-300 overran runway 24L in Toronto while landing in heavy rainfall and thunderstorms with poor braking action. The aircraft came to rest in a ravine and immediately caught fire. All 309 occupants managed to evacuate the aircraft before it was destroyed by the post-impact fire. The cabin crew

took decisive and timely action and initiated the evacuation without waiting for an evacuation signal from the flight deck.

Fire outside the aircraft was visible from the cabin and smoke was entering the cabin. The crew reacted to the events unfolding and applied their judgment to initiate evacuation without waiting for instructions from the flight deck. This was a crucial factor that saved lives as the cabin evacuation signaling system had become inoperative during the crash.

Some cabin crew donned protective breathing equipment to protect themselves against the inhalation of toxic fumes.

When the ARFF crews arrived at the crash site the evacuation was complete and the aircraft was engulfed by fire. The post-crash fire was intense and violent. The presence of large amounts of flammable substances such as fuel, oxygen, rubber tires and hydraulic fluid make aircraft fires especially dangerous. The intense heat from an aircraft fire can melt the aluminum alloy of the aircraft fuselage in as little as three minutes. For fuselages made of composite materials this time is considerably shorter.

In 2006 an A310 operated by OAO Aviakompania Sibir overran the runway at Irkutsk at high speed and collided with buildings. In the intense post-crash fire 75 passengers and 3 cabin crew members out of a total of 203 persons on board managed to evacuate the aircraft. All survivors evacuated the burning wreck within the first 60 seconds following the crash. Thereafter the intensity of the fire precluded any further rescue attempts.

Conditions inside the aircraft cabin quickly became un-survivable due to high carbon monoxide concentrations and intense heat. Rapid evacuation is essential to survival!

Don't Wait to be Rescued

The first priority for the ARFF personnel is to safeguard escape paths outside the aircraft for occupants to self-evacuate to safety. The ARFF personnel will focus on fire control first before starting rescue attempts inside the aircraft.

The US National Fire Protection Association's (NFPA) "Guide for Aircraft Rescue and Fire-Fighting (ARFF) operations" defines aircraft

rescue as the "action taken to save or set free persons involved in an aircraft incident/accident by safeguarding the integrity of the aircraft fuselage from an external/internal fire, to support self-evacuation, and to undertake the removal of injured and trapped persons".

Every Aerodrome is Different

The minimum aerodrome category for rescue and fire fighting required for a specific aircraft type depends on its fuselage length and diameter. The larger the aircraft, the higher the aerodrome category for rescue and fire fighting required.

ARFF capabilities vary widely between aerodromes, despite ICAO has laid down ARFF standards and recommended practices in the ICAO Airport Services Manual, Part 1, Rescue and Fire Fighting.

The aerodrome category for rescue and fire fighting is based only on 4 parameters: the quantities of water and complementary extinguishing agents available and the number of aircraft fire-fighting vehicles and their total discharge capacity.

Modern ARFF technologies such as GPS-based moving map navigation displays, ground radar transponders and forward-looking infrared (FLIR) video camera systems are not considered. Tools for cutting and piercing the fuselage of an aircraft and nozzles fitted on extendable booms designed to pierce aircraft fuselages to allow the delivery of extinguishing agents into the interior of the cabin are available at large aerodromes. ICAO does not consider the level of sophistication of ARFF equipment in aerodrome ARFF classification.

Aircraft operators are wise to consider the available ARFF category of all aerodromes planned to be used. They should meet the required aerodrome category for rescue and fire fighting for the aircraft type operated.

ARFF Aircraft Knowledge

Fire-fighters need to be familiar with a large range of different aircraft models. One valuable source of information for ARFF personnel are crash charts provided by the aircraft manufacturers. Most aerodromes have crash charts available for the aircraft which regularly use the aerodrome. The crash charts for business aircraft



which visit airports at irregular intervals may often not be available to the ARFF crews.

And even when available, the cabin layout business aircraft is often customized and can vary considerably from one airframe to the next. Modifications performed after delivery of the aircraft from the manufacturer, including the installation of long range fuel tanks, will also not be reflected on the crash charts. This is also true for freighter conversions of passenger aircraft.

In addition, the lack of emergency cut-in markings on the fuselage of many business jets denies the ARFF crews potentially vital information for aircraft access.

Conclusion

Given the advances in crew training on evacuations and the technical advances in ARFF equipment and training the outcome of the in-flight fire on-board the Saudi L-1011 would probably be very different today. For flight crews a thorough pre-flight preparation and good knowledge of evacuation procedures can make a big difference one day, since as we all know, luck favors the prepared.

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IMPROVED

Technical advances in Aircraft Rescue and Fire Fighting equipment means on board fires are more easily dealt with than before.