IFALPA
The Global Voice of Pilots

Position

19POS13 11 December 2019

Onboard Protection Against Fire & Smoke

PLEASE NOTE: This paper supersedes 11POS02 – Protection Against Fire and Smoke: Design and Procedures.

EXECUTIVE SUMMARY

IFALPA believes that the results from the industry initiative on smoke and fire following the Swissair 111 accident should become industry best practice and be implemented worldwide.
IFALPA believes that a follow-up initiative is necessary to develop further industry guidelines to improve safety. This follow-up programme must address the following items:

- Aircraft design
- Fire detection and fire-fighting
- Protection of crew and passengers
- Impact of new materials
- Survivability

In addition to the obvious and significant improvement in safety for the travelling public, adoption of the existing recommendations and those thrown up by a further study are likely to yield considerable benefit in the reduction of nuisance diversions, as well as the exposure to liability from future legal action arising from longer term health problems.

BACKGROUND

Since the beginning of the industry fire has been one of the greatest threats to the safety of the travelling public. While advances have been made to reduce the risks, the danger posed by fire and smoke remains a significant threat.

The problem is assessing the scale of the threat posed by a fire or smoke event. Current fire warning systems do not discriminate between a contained fire and a fire which may be uncontrolled and present a significant threat to flight safety. In 1999, the US FAA recorded over 1,000 incidents where smoke or fire were reported. Of these, 360 resulted in emergency or precautionary landings of commercial airliners. In other words, nearly one incident a day. A 2003 report of a study into emergency or precautionary landings of Extended Twin Operations (ETOPS) aircraft showed that incidents involving smoke or fire were the second most frequent cause of diversions, accounting for 20% of diversions. The study concluded that ETOPS aircraft are twice as likely to divert for smoke or fire conditions compared with engine problems.

In addition to the safety issues, these diversions pose a significant financial cost to airlines. One study showed that the average cost of a single diversion by a wide body airliner is between US$89,400 and US$181,800 when all the factors were considered.

THE INDUSTRY INITIATIVE ON FIRE AND SMOKE

Following the recommendations as published by the Canadian TSB after the Swissair 111 accident, IFALPA supported and participated in the industry initiative on smoke and fire. The results of this initiative dealing with procedures and checklists for in-flight fire were published in 2003.

Unfortunately, these recommendations have not yet been adopted and turned into best industry practice by all operators. As a result, the potential safety improvement that these recommendations would bring has been withheld from passengers and crews. IFALPA argues that the implementation of these new procedures should be of paramount importance due to the potential risk and the seriousness of the consequences should a fire break out in flight. In 2005, the Federation detailed its policy on on-board fire-fighting capability in IFALPA Annex 6 which states, "*IFALPA believes that in any case of possible fire or smoke in the aircraft, the smoke and fire-fighting operating procedures should reflect the need to prepare to land the aircraft expeditiously, within a time frame that will minimize the possibility of an in-flight fire being ignited or sustained*."

FOLLOW-UP INITIATIVE

Further recommendations from the Canadian TSB and other Investigating authorities call for further investigation of the impacts of fire and smoke. IFALPA also has polices which must be addressed as part of this much-needed follow-up. In IFALPA´s view the following areas must be addressed:

AIRCRAFT DESIGN

IFALPA Annex 8.4.1. Fire Precautions states, "*IFALPA believes that the most effective way to avoid in flight fire or smoke is proper design and proper maintenance in order to avoid a possible ignition, fire propagation, and accessibility.*" This means that the overall design should minimize the possibility of an in-flight fire, using best industry practice and fire-suppressing materials. This includes fuel tank ignition prevention as well as the use of materials that do not emit flash fire gases, poisonous gases, or particles.

Use of advanced electrical systems like "self-healing electrical cables", improved modern "trip-free" circuit breakers, should be mandatory. Detectors for smoke and/or toxic gases could be incorporated into the air-conditioning system and/or bleed-air system. Fire and smoke condition warnings shall remain active, as long as the condition exists.

FIRE DETECTION AND FIRE-FIGHTING

IFALPA policy on in-flight fire-fighting capability was established in 2005 and can be found in IFALPA Annex 6: "*IFALPA believes that flight crews should be provided with a system, whose elements are complementary and optimized to provide the maximum probability of detecting and suppressing any in-flight fire*."

For IFALPA Provisions on fire protection of cargo compartments, please see 19POS02 – Fire Protection of Cargo Compartments, https://www.ifalpa.org/publications/library/fire-protection-of-cargo-compartments--2927.

In order to make this a reality, a review of the fire critical areas is required; assessing places like the galleys, the IFE (In-Flight Entertainment) control areas in the cabin, the overhead areas, and other places that cannot easily be accessed during flight. These areas must be equipped with fire detection and fire-fighting equipment, including hand-held fire extinguishers and smoke hoods, where required.

Fire extinguishers shall be equipped with supplemental discharge extensions. For difficult-to-access areas, dedicated discharge points with installed extension tubes would improve the effectiveness and reaction time of fire-fighting procedures. Appropriate training of the crews has to be assured.

Turning to the cargo areas, evidence clearly shows that an unambiguous situational awareness of the severity of the threat caused by a fire and smoke situation on board enables the crew to take the appropriate actions to save the aircraft, its passengers and crew.

IFALPA Annex 8 deals with this area in a policy established in 2008 which states: "*All cargo compartments shall have fire detection and extinguishing capability, and the associated controls for this equipment shall be readily accessible to all flight crew when seated at their work stations*."

For this to be possible, all cargo areas must be equipped with up-to-date fire detection and fighting equipment, giving the flight crew a clear understanding of the actual situation. All Class D cargo compartments shall be upgraded to Class C.

TOXICITY OF MATERIALS USED IN THE AIRCRAFT

The greatest care must be taken in the selection and use of all materials supplied in the interior of the aircraft with regard to its capability of incapacitating or harming all on board the aircraft, especially when exposed to heat or pressure, with the health of the crew and passengers as a primary goal.

As stated in IFALPA Annex 8: "*All materials and furnishings used in cabin interiors shall be limited to those which do not produce smoke or toxic gases in quantities sufficient to incapacitate the occupants. States shall develop, as a matter of urgency, certification requirements to limit toxic gas and smoke emission from cabin materials and establish criteria for test methods. Such certification requirements shall be made retroactive so that they also apply to aircraft in current service*."

ASSESSMENT OF THE RISKS ASSOCIATED WITH NEW MATERIALS

The increased use of carbon and other composite materials in airframe and engine manufacture in the primary structure as well as insulation blankets, electrical cables, and other ancillary items, is generating concerns over the health impact of emissions from these materials. Recent research into the toxicity of these materials has revealed that they are not as harmless as first supposed, especially when exposed to heat. These concerns include increased cancer risk due to particulate emissions and the development of so-called ultra toxics (such as those created when the World Trade Center towers collapsed following the attacks of 9/11). The potential for these materials to cause harm may lead to a reassessment of the protection available for flight crews and for members of the emergency services attending an incident or accident. There may also be a requirement for and assessment of the effect of exposure on all people (on the ground as well as in the air) exposed to these emissions for a prolonged period.

INCAPACITATION AND SURVIVABILITY

Regarding smoke and its effects, IFALPA policy states, "*Flight crews are considered incapacitated if their vision is impaired to a point where they can no longer see primary instruments, checklist, or outside in the direction of flight. Flight crews are also considered incapacitated if they do not have sufficient breathable air to sustain operation*."

The effect of continuous smoke emissions has been long been established as a leading factor in aircraft in a number of incidents and accidents. In spite of recommendations by the US FAA, present certification requirements do not take into account possibility of continuous smoke emissions. As a result, the provisions do not define means of maintaining the view of the outside world as well as the view of the primary flight instrumentation. Furthermore, the volume of Oxygen carried for flight crew use prohibits the use of oxygen at 100% flow for extended periods which will limit the ability of the crew to bring the situation to a safe conclusion. IFALPA regards the resolution of this issue as key to improving safety and solving the problem as paramount.

Focus should also be given to the effect that the provision of sufficient fire extinguishers and smokehoods in the cabin and galley area and additional flight deck equipment (such as quick-donning full face masks) will have on incapacity and survivability.

In any case, the number and types of extinguishers provided should be capable of extinguishing or containing any fire likely to occur in the cabin. The locations and storage of extinguishers should be such as to be easily and rapidly accessible from any position in the cockpit and cabin; the locations should be such as to be easily identified by the crew members.

The tools to access hidden places for fire-fighting are the crowbar and/or the crash axe, as provided by current regulations. More appropriate tools for use in the modern cabin environment are available, but not installed. (This also is an important item in the Security agenda).

Optimum escape path markings and emergency lighting is required for a fast and successful evacuation in case of a smoke-filled cabin. Locations and design of those systems should be reviewed and updated if required.

CRASH AXES AND CROWBARS

Some Regulations, such as EU 965/2012, require airplanes over a certain weight and/or maximum operational passenger seating configuration to be equipped with at least one crash axe or crowbar located in the flight crew compartment and/or in a galley. These items are normally designed to be used for accessing hidden places for fire-fighting purposes, but ICAO Doc 9811 also has provisions for use of a cockpit crash axe by the flight crew as defensive tool in case of breach of the flight crew compartment. When the crash axes or crowbars are located in the cabin, they should be stowed in such a manner that they are both easily accessible by the crew, but never visible to passengers.

CONCLUSION

There can be no doubt that the threat posed by in-flight smoke and fire is a serious one. This fact alone makes the case for not only the immediate implementation of recommendations made more than seven years ago but also a further review of the threat and effective countermeasures. Furthermore, the investment made in improved fire detection and suppression systems will bring fiscal benefits that will do much to offset the cost of the improvements.

As always, IFALPA's core belief is that the highest level of safety should be applied worldwide and in all types of commercial air transport operations. Accordingly the preceding requirements should be applied no matter how large or small the aircraft, or its type of operation, cargo or freight and its nation of registration.