Proposed ICAO Fire Test Changes Compromise Fire Safety

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A divergence in safety standards, particularly when it is from the same organisation, is uncommon. Rarely do we see proposals that push the boundaries and increase the difficulty of passing a new higher standard level, while at the same time seeming to "dumb down" the requirements for passing the current standard levels, by making them considerably easier to pass. How does this affect users of the standard trying to distinguish between products approved before and after these changes? Many are understandably concerned over the impacts of these changes on Airport Rescue and Firefighting (ARFF) safety.

The generally accepted proposal of a safety standard is to increase stringency over time to provide better regulation and improved protection and safety, for those to whom it relates. New or upgrade standards usually arise once a solution has been achieved, proven and verified by extensive testing. It was therefore exciting to find the International Civil Aviation Organisation (ICAO) trying to reverse this process, raising the bar on firefighting foam standards, by seeking a higher performance level, ahead of the solution.

These proposals have challenged the fire industry to develop even higher performance products that could help airports better address the combined problems of increasing passenger traffic, larger fuel loads and potentially more aggressive fires from using larger "super jumbo" jets like the Airbus A380. This aircraft can accommodate up to 800 passengers on a single flight, almost double the practical maximum for a Boeing 747-400 "Jumbo" jet. All survivors will need rapid evacuation to avoid being overcome by noxious smoke in a fire incident.

New Level C Test Proposed

The attraction of this proposed new Level C test is that it would permit substantially reduced quantities of foam agent and water to be available on fire trucks to meet existing airport response requirements. This has substantial cost saving implications in terms of fewer trucks, lower staffing levels, and potentially cheaper vehicles as a standard chassis could be used due to the reduced payloads projected. Required performance criteria could potentially be achieved within a non-specialist, non-custom built truck category at substantially lower costs. These resulting economic incentives are significant for airport operators, particularly larger category airport hubs. They are expected to embrace this new Level C requirement once scheduled implementation occurs in November 2013, assuming member States ratify it after the discussion period, expected to start in July 2012.

Key objectives of this proposed C level, mirror those for existing Level A and B fire tests. That is:

- To extinguish the test fire within 60 seconds.
- Achieve less than 25 percent foam blanket burn-back from exposure to heat and fuel within 5 minutes from burn-back pot ignition.

It is anticipated that this proposed Level C anticipates a 25 percent reduction in practical application rates to around 3.5L/min/m^2 delivered by ARFF services, from the current 5L/min/m^2 of fire area commonly adopted by ARFF services in much of Europe, the Middle East and Asia.

The generally accepted principle of a safety standard is that it increases stringency over time to provide better regulation and improved protection and safety, for those to whom it relates. However, safety is being compromised by the ICAO's proposed fire test changes.

Requirements for Level C

Key proposed performance changes hinge on a substantial lowering of the firefighting foam application rate on the Avtur Aviation Kerosene test fuel. The test rate is being reduced by 30 percent from 2.5L/min/m^2 at current Level B standard, to 1.75L/min/m^2 while using the existing UNI 86 aspirating test nozzle, so the foam quality requirements remain unchanged. The fuel and water base are increased by 57 percent to 157 litres each, and the circular fire tray area is also increased by 63 percent to 7.32m^2.

Achieving this Level C criterion requires at least a three-fold increase in fluorotelomer surfactant levels over existing Level B approved AFFF foams, according to Solberg's Luc Jacobs presentation at the UK's 2009 Reebok Foam Conference entitled "ICAO Level C Performance", which emphasises just how tough it is to pass.

Can Multiple Finishing Posts Ever Be Acceptable?

Any standard requires a clear pass/fail criterion to be of value. This provides a meaningful benchmark to those expected to use it and make decisions based on its repeatability.

This Level C fire test requires fire extinguishment (meaning no flames) within 60 seconds. However there is a worrying note suggesting that small flickers between the foam blanket and fire tray are permissible (meaning that the fire is not extinguished)! It suggests these flickers should not exceed 25 percent circumference of the tray and

must be extinguished before foam application stops at 120 seconds.

How and why extinguishment should suddenly shift from 60 seconds to potentially 120 seconds and include existing Level A and Level B fire tests is not explained but, in future, it would allow substantially inferior foam products to pass, seriously diluting the current standard and causing major confusion for ARFF services. The presence of persistent flickers in a fire test is evidence of non-extinguishment and indicates a significant risk of re-ignition during an emergency. It effectively doubles the required extinguishment time, meaning that the quality of foam meeting this standard is potentially halved, defeating the primary objectives of this standard: to raise the bar; and clearly separate acceptable, from unacceptable.

The acceptance of flickers in the ICAO Level C fire test offsets the increased strength of the test from the larger fire and lower application rate, so

what does it achieve? It jeopardizes the goal of Level C, to encourage the development of more effective and efficient foam agents, for use in aviation. We understand only two AFFF foams have so far met this 60 seconds extinction criteria at Level C, but it is not clear whether these products were allowed to pass the test with flickers, or not.

Perhaps this dilemma, triggered the idea of allowing flickers within these proposals? Alternatively, perhaps it indicates this test was designed hurriedly to allow potential cost savings by airport operators to be quickly realised, rather than identifying key parameters needed for safety improvements with clear pass/fail criteria, so everyone can benefit.

Fixed or Moving Foam Delivery

Another area of concern includes the fixed position nozzle. Although reducing human interference during testing, this potentially makes the test harder, but the results more comparable. It does not easily replicate practical firefighting where nozzle movement around the fire area is instinctive and ubiquitous. Maybe it helps build additional safety margin?

Extinction or No Extinction?

The Oxford English dictionary defines extinction as: *"no longer burning; out; quenched; has ceased activity; has died out"*. So how can persistent flickers after the defined 60 second extinguishment time possibly be acceptable? It is clear; the fire is either out, or still flaming. Any fire protection standard should recognise this as a fundamental distinguishing requirement.

A bigger concern is that allowing flickers at all levels substantially "dumbs-down" and weakens both well-established Level A and Level B fire tests.

Likely Impacts of Allowing These Flickers

Diluting the performance criteria by allowing flickers would allow previously unacceptable, less

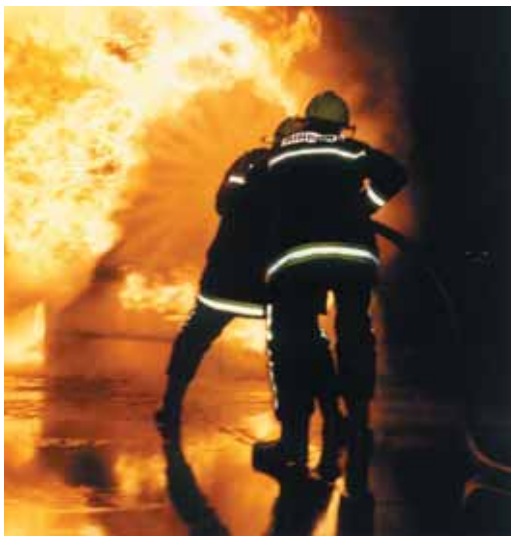
effective foam agents to meet ICAO standards and be used at airports worldwide. This has the potential to delay or prevent fire control and extinction in an emergency, unnecessarily increasing the risk to passengers, crew, and firefighters.

- **Unacceptable Quality Passes**
  Numerous currently unacceptable quality AFFF and Fluorine Free Foam (F3) concentrates at airports worldwide, could suddenly qualify as "acceptable" if these proposals are accepted. This could not only delay or prevent fire control and extinction in an emergency, but also increase the risk of unnecessary injury or death to casualties, passengers, crew, firefighters and other rescue personnel, with no justification. Can this be right?

- **Additional Foam on Trucks**
  Future foam purchasers may not realise these implications when they are suddenly offered much cheaper "approved" but inferior quality products, that no longer meet their expectations based on current ICAO Level B approved products. Using less effective foams should require additional foam and water resources to be carried on fire trucks, offsetting this lower performance ability, producing the opposite effect of what ICAO set out to achieve. Why?

- **Return to Mil-F**
  These changes may encourage a return to the US Mil-F spec. Currently only Mil-F spec. AFFFs are allowed to be used at all airports across the USA, which despite its many faults, at least gives clear pass/fail criteria.

- **Increased Risk of Injury**
  Fires that would normally be extinguished quickly and efficiently within three minutes by consistent high performance foam concentrates, allowing passengers and crew to exit an aircraft safely and have the best chance of survival, may with these changes continue burning and struggle to put the fire out. Such delays in extinction could significantly increase the chances of unnecessary injury or even death to casualties, passengers, crew, firefighters and other rescue personnel, without justification. Why? How worrying is this for all of us passengers?



- **More Lives at Risk**
  There is a clear desire among several airport operators to be using Fluorine Free Foam (F3) but they are prone to sudden flashbacks and rapid re-involvement. So far only three F3 products claim an ICAO Level B certificate, although there are concerns in several circles about how this was achieved, since others cannot replicate these claimed results. With these changes allowing flickers up to 120 seconds, many other F3 and inferior quality AFFF products will suddenly be capable of gaining ICAO Level B certification, increasing the dangers of delayed extinction and sudden flare ups or flashovers, undoubtedly putting many more lives at risk.

High Ambient Temperatures Reduce Safety Margins

Of concern to firefighters is the margin of safety erosion forced by these changes, which have been

traditionally maintained by these standards to protect firefighter and passenger lives. Many airports around the world permanently exceed the test ambient air temperature range of greater than, or equal to 15°C, which most will try to minimise. At higher temperatures foam bubble quality is usually reduced, fire extinguishing ability is frequently slower, and burn-back periods are regularly shortened, even with high quality products. Inferior products may not be capable of extinguishing fires at normal application rates under prevailing ambient conditions. Sudden flash-backs may occur quickly that could endanger the lives of firefighters and passengers alike. Human-induced global warming is likely to exacerbate these problems, as ambient temperatures continue rising.

Safety Impacts of Fluctuating Water Pressures and Water Quality

Fluctuating water pressures can also erode the safety margin of the foam. As pressure drops, inferior foam quality may be produced. Utilising lower quality foams may cause failure to extinguish or sudden flare-ups that could endanger lives. Poor water quality makes these problems worse.

Practical Fire Fighting Usually Relies on Inferior Foam Quality

Foam quality from practical nozzles often falls short of UNI 86 test nozzle performance. There appears to be no allowance in these changes to this reduced foam quality, resulting from the actual jet/spray nozzles and vehicle monitor streams normally used by ARFF teams around the world. Any safety margin that was provided by the current ICAO level B fire test could soon be eroded by allowing these flickers, putting more lives unnecessarily at risk.

Some foam types, notably F3, are not designed for use with non-aspirating nozzles and produce no film forming capability, which is often relied upon by ARFF firefighters for personnel safety. The standard should be addressing this in some way, possibly by having an additional non-aspirating nozzle test requirement.

Product Repeatability and Reliability

Insufficient consideration seems to have been given to the reliability and consistency we should expect for aviation applications. These should improve over time and be re-enforced by international standards. Allowing lower quality products with greater performance variation, contradicts the purpose of this previously well respected standard.

In conclusion, all ARFF firefighters and operators, airlines and airport management organisations should be concerned about these adverse impacts. Diluting the performance criteria by allowing flickers could allow previously unacceptable, less effective foam agents to meet ICAO standards and be used at airports worldwide. This has the potential to delay or prevent fire control and extinction in an emergency, unnecessarily increasing the risk to passengers, crew, and firefighters, and increase, not reduce, the amount of foam agent required.

Everyone's safety is being compromised by ICAO's proposed changes allowing these flickers.

We urge all readers to inform their member State representatives about the dangers of these adverse impacts, and request them to seek the removal of this proposed change to allow flickers at Levels A, Level B and Level C. A clear 60 seconds extinction time needs defining for all levels. This should achieve what this standard seems to be aiming for and we all strive towards, an enduring improvement to global aviation firefighting safety standards. APF

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