Response from the Asia-Pacific Cabin Safety Working Group to the Review of "Airport Firefighting Services in Australia" by Russell V. Smith for the Civil Aviation Safety Authority

December 1998

The Asia-Pacific Cabin Safety Working Group (CSWG) is an initiative of The Australian Society of Air Safety Investigators. It comprises safety and survival specialists from all facets of the industry in the Asia-Pacific region.

The following report expands upon concerns expressed by the Group regarding the content of the Russell Smith report.

1. Summary

1.1 The Asia-Pacific Cabin Safety Working Group has serious concerns regarding the methodology used in the Russell Smith report and some of the conclusions it draws. Safety is our prime concern both for those who work within aviation and those who travel as passengers. However, we also recognise the constraints of limited resources upon the system and the need for the economic use of these scarce resources.

1.2 On the basis of the evidence presented in the report, the Group believes there is a need for a more balanced, in-depth review of ARFF to be carried out before changes like those recommended in the report, are embarked upon.

1.3 We feel that many of the comments made within the Russell Smith report are based on fallible logic and have the potential to mislead the reader. These include attractive statements like the promised "...releasing of funds for other positive safety enhancement programmes" (Executive summary statement 5) up to $30 to $35 million. They may sound attractive, however, on past performance the use of savings from one area has not been obvious in other areas, especially when the needs have not been identified before the savings are implemented.

1.4 The lack of research integrity casts considerable doubt on the conclusions that have been drawn and, as such, it is unwise to base safety critical decisions on this document. Further work is recommended.

1.5 The CSWG is not adverse to change and does not stand in the way of genuine progress, but issues as serious as major reductions in ARFF, or

indeed an attempt to challenge ICAO's objectivity, require an appropriate level of expertise in a number of related fields, which is beyond that of any one individual.

1.6 To state that "Nothing from the analysis of minor accidents and incidents would indicate that the current virtually accident free state of higher capacity Australian airlines operations would not continue indefinitely" is an untested opinion and as a result the conclusions drawn are untested and possibly unsound. Australia's safety record is the result of hard work and numerous safety margins, but future success is certainly not guaranteed because of past performance.

1.7 After reviewing the report, the following issues are raised for consideration by CASA. It is not an exhaustive list as a thorough review of the Russell Smith report would take probably more effort than the original document. The CSWG will be more than happy to assist in the future, when, we hope, the review is revisited at the level it deserves.

2. Primary versus Secondary Safety

2.1 The provision of Rescue and Firefighting Services at airports represents a secondary safety measure. In other words, ARFF provides a means of mitigating the consequences of an aircraft accident on or near the airport and therefore, by definition, requires things to have already gone wrong. Other secondary safety measures include the provision of seat belts, life jackets and evacuation slides.

2.2 Primary safety measures on the other hand, are concerned with preventing accidents and include Ground Proximity Warning Systems (GPWS), Instrument Landing Systems (ILS) and training. An ideal world would favour primary safety measures, such that secondary safety measures were rendered unnecessary. However, we do not live in a perfect world and although there are numerous excellent primary safety measures, systemic safety requires them to be backed up with secondary safety measures.

2.3 The CSWG expresses concern regarding the oversimplistic argument regarding the allocation of the "...limited safety dollar". The assertion that reductions in the order of $30 to $35 million from cutting back ARFF coverage would have the effect of "...releasing funds for other positive aviation safety enhancement programmes" is, at best, naive and at worst, misleading. Whilst there are a number of unfunded or underfunded safety initiatives which can enhance aviation safety, It is oversimplistic to suggest that these would be funded by savings made through cuts to the

ARFF.

2.4 Suggestions within paragraphs 2.80 - 2.86 regarding "Competition for Safety Enhancement Funding" appear to be generally vague and poorly researched. Phraseology such as "A fair guess is..." and "This may account for..." supports our assertion. Buzz phrases such as "accelerated acquisition of GPS", "arresterbed", "cabin sprinkler systems and ...rearward facing seats" may all seem to be positive safety enhancement, but the issues are not so clear cut. For example, rearward seats are of little use if passengers are knocked out by debris from overhead lockers, or cannot escape the aircraft because of a lack of ARFF to clear an evacuation path. Indeed, even if rearward facing seats were legislated, they cannot be economically retrofitted because of the required increased floor strength.

3. Accident Statistics

3.1 Australia has a good record for aviation safety. It has never lost a passenger in a jet RPT aircraft accident and therefore appears to be an above average country in terms of safety. Flight International (Taylor, 1991), Boeing (1993), Eastburn (1987), Oster et al. (1992), Barnett et al. (1979) and IAPA (1993) all produce evidence which puts Australian aviation or its main RPT airlines at the top of the list in terms of safety record. However, this is not to suggest that Australia is either the safest nation or will continue to be above average in the future. Past performance is no guarantee of future success.

3.2 Smith suggests "Whether Australia's remarkable safety record is merely fortuitous or whether there are factors involved in unclear; far more likely, however, is that quality of the Australian aviation industry and the environment are the determinants"

3.3 Aviation safety is not a matter of luck. Commentators may well look back at incidents which, through various factors, were prevented from becoming accidents, and consider the outcome to have been 'fortuitous' or 'lucky', but that is a value judgement after the event. To suggest that Australia is blessed with any more 'luck' than anywhere else is to underestimate the real reasons behind its safety record.

3.4 Whilst the natural environment has played a role in Australia's aviation safety record, the fact that 100% of aircraft accidents contain some form of human error and around 80% of accidents exhibit human error as a primary cause, suggests that the human and operational environments have had a more significant role to play (see Braithwaite, 1998).

3.5 Whilst weather may be generally benign, it is also prone to extremes and there is a strong argument that lack of experience is a heightened risk in Australia when these conditions occur. Microbursts and windshear around Sydney airport are an excellent example of where perceived risk has become based more on 'lack of incidents' than the 'lack of incidence'. Indeed, scientific studies have found that the incidence of windshear / microbursts in Australia are significantly higher than was previously expected. As traffic continues to grow, so the risk of an accident will increase.

3.6 Smith's comments, "By comparison to Europe and North America, Sydney International Airport's aircraft movement is near deserted and the Australian skies, not only are they mostly clear of weather Summer and Winter, but also relatively empty." (para. 1.55) This is a weak conclusion that is ignorant to factors such as Air Traffic Control. Traffic density is only relevant to the provision of services such as ATC which can operate at a number of different levels of complexity and with different numbers of controllers. For example, are two RPT jets flying in see and avoid conditions more safe than four flying under primary radar coverage?

3.7 There is the constant and chronic threat of complacency which is associated with any operating system that appears to be working. A lack of accidents is only a very rough guide of system safety health and in aviation, where the consequences are potentially catastrophic, not a sensible measure of current performance. The determining factors as to whether Australia manages to keep its clear record for fatal aircraft accidents do not include the past accident record. Proactive safety management requires continual improvement of the system to meet the consumers' changing demands. The response by the public to the Seaview and Monarch accidents and its demands that on the Regulator to perform better indicate that the customer wants improved services and not the lower standards of risk management proposed in the Smith report.

3.8 Risk has two components. There is the risk of an event occurring, and the extent of pain and suffering likely to be experienced when an event does occur. The Australian public has very high expectations in relation to aviation risk management. The public's response, via their elected representatives, to the Monarch and Seaview accidents is testimony to this proposition. They do not want accidents to occur, and if they do occur, they demand worlds best practise in relation to avoiding and minimising the pain and suffering after the event. They are prepared to pay for this level of risk management. The ARFF plays a pivotal role in pain and suffering management. The Australian public has an expectation that they will be rescued after an accident by qualified personnel. The Smith report recommends abandoning this rescue role.

3.9 Smith, in his report, provides no evidence of seeking or responding to passenger requirements in the ARFF aspect of risk management. He asserts that the users of the system are the airlines. In fact it is the passengers who fund the system. The airlines do not survey their passengers on this aspect of travel, nor do they provide passengers with costed options in relation to the provision of these basic survival tools. As a result, the conclusions drawn on the acceptable levels of ARFF provision in Australia are unsound.

3.10 The CSWG takes issue with the statement, "1.74 Furthermore, from the foregoing assessment, it is equally apparent that Australia has no significant record of event relatively minor accidents. Two aircraft landing without a nose gear extended, one of which also had an engine shut down and the other with a hole punched in the wing-to-fuselage junction, mean virtually nothing in aviation accidents terms. While the B-727 engine fire at Brisbane was potentially more serious, but with two minor injuries from use of evacuation slides, the event would rate as an incident in the U.S." Such conclusions indicate a frightening lack of understanding of the importance that credible industry experts are now placing upon systemic safety.

3.11 Whilst fatalities are generally used as measures of (un)safety, a lack of fatalities is not a reliable measure of aviation safety. Woodhouse and Woodhouse (1997) argue that the most reliable indicator of risk in aviation is accident rate (accidents per million sectors). They suggest that, "Accidents are a more appropriate numerator than either fatal accidents or fatalities because the survivability of accidents is so much a matter of chance." However, they also add a cautionary note regarding the existing databases of aircraft accident statistics. "Until 1993, notification of accidents to ICAO was a recommended practice rather than a standard. ICAO data is therefore incomplete, particularly for 'serious damage' accidents".

3.12 Waldock (1992) wryly observes the problems of observing 'safety' in aviation even through the collection of accident statistics; "...they are rare events; they don't happen frequently enough to generate a large enough population to be valid. One bad accident can skew the statistics drastically. If we had more accidents to work with, we could probably do a better job of measuring safety by statistical analysis".

3.13 In the case of Australia, one of the "...relatively minor accidents" cited by Smith provides a clear example of the fallibility of using 'fatalities' as the measure of significance. Boeing 747 VH-INH landed at Sydney Airport with its nose wheel retracted, with no serious injuries to passengers or crew. The ARFF was instrumental in this outcome, by

communicating with the flight crew advising that an evacuation via the slides was not necessary. This communication prevented injuries to passengers which are commonplace where slides are used. This was especially pertinent in the VH-INH accident where the rear slides would have been at an exceptionally steep angle.

3.14 BASI conducted a thorough, systemic investigation (B9403038) from which a number of major changes, particularly within Ansett Australia, have taken place. There was a laudable recognition that, in terms of latent failures within Ansett and CASA, there was very little difference between this accident and a fatal one, other than in terms of outcome. Indeed, a go-around was called for upon notification from ATC that the nose-wheel was not down, which, had it been executed, would have probably led to the loss of the aircraft.

3.15 To suggest that "...landing without a nose gear is little different from a normal landing" (para 1.39) is incredible. For Smith to further claim that "...to contend that this 'incident' might have developed into a major crash is again unsustainable" (para. 2.33) is similarly vexing. Such conclusions suggest an arrogance towards the seriousness of the VH-INH accident and it is reassuring that Ansett Australia and BASI did not follow this path. It is an indication of an individual who has a flippant attitude to the management of pain and suffering and / or the needs of the Australian consumer. As such the conclusions the individual makes in relation to these matters are unsound.

3.16 The Russell Smith report seems to concentrate on 'fatal accidents' in its analysis of US Part 121 airlines (Part 1) and even removes a number of fatal accidents from the NTSB list. This is apparently justified with the statement "The point addressed here is that aircraft accidents statistics are of little use without refinement for a specific purpose."(para. 1.11) Why fatal accidents are more significant than hull-losses in terms of contributory factors is not explained. The ten year period is a short one, for aviation safety statistics and the decade (1988 to 1997) and area chosen (USA) conveniently ignores a number of major accidents where ARFF played a significant role (e.g. B-737 at Manchester, 1985; B-737 at Kegworth, 1989; DC-10 at Faro, 1992; DC-10 at Fukuoka, 1996).

3.17 We assume that it was the author that "...deemed ten years to be an adequate period for the predictive purposes of this study." (para.1.19) To suppose that this limited time period and location represents a sound statistical base on which to build the report is short-sighted. To then call the 1988/92 period an "apparent aberration" borders on the manipulative. To take this to its extreme, one might as well suggest 1977

to be an aberration for B-747 accidents, 1996 to be an aberration for in-flight fires etc. Aircraft accidents are, by their very nature, 'aberrations' in what is a generally safe system. This only goes to demonstrate the loud statistical noise caused by fatal accidents over short periods of time.

3.18 Statistics used in paragraphs 1.33 to 1.53 seem to support the 'low risk' argument well, but are open to serious question. For example, In paragraph 1.42 "...18 instances of ground equipment, catering trucks and baggage trains causing minor damage to aircraft" over a ten year period. Damage from ramp accidents is a chronic problem within aviation which has generally been under-reported. "Total global estimates put the cost of ramp and associated damages at US$2 billion per annum, and that equates to 3 or 4 brand new B747-400s per month, with individual airlines admitting to losses in excess of US$1 million per year." (Oldfield, 1997)

3.19 In paragraph 1.44, a total of 44 fuels spills are cited as being listed in the BASI incident database. In contrast, for the period 1/1/97 to 18/12/98, the ARFF database records attendance at 446 fuel spills (also, by definition, this total represents only the airports which Airservices currently provides ARFF cover).

3.20 The BASI figures cited by Smith point more to an unfortunate lack of reporting to the database than to a lack of incidents, and should be viewed with extreme caution.

3.21 In para 2.8, Smith suggests that in his analysis of seven fatal accidents on US airports where there were associated fires "...the presence of airport firefighting services did not seem to alter materially the ultimate survival outcome". He continues to add that "...the passengers evacuated the aircraft or escaped from the wreckage by their own efforts". This conclusion appears to be based upon a lack of discussion about ARFF within the NTSB reports other than general comments. The role played by ARFF is in suppressing fires to allow for evacuation is ignored apparently because the NTSB did not explicitly say that they did their job. Accident reports, by their nature tend to focus on what people did wrong rather than what they did right. The absence of comment regarding the accomplishments of the ARFF is more likely to be linked to the fact that they did what they were expected to do, rather than not doing anything.

3.22 In 1985, when B737 G-BGJL caught fire on take-off from Manchester International Airport, it is unlikely that any of the passengers would have escaped if it were not for the ARFF efforts in knocking back the fire to allow evacuation. Smith seems to infer lack of performance by the ARFF by stating "All passengers who survived the accident self evacuated with cabin

staff assistance from front and over-wing exits, except for one boy." The aim of ARFF is knock down large aircraft fire to enable evacuation through establishing rescue paths.

3.23 Whilst it is true that ARFF generally are limited in their ability to suppress interior cabin fires because of the mass of evacuating passengers, this is not the full story. ARFF have a major role to play in knocking down fires before they penetrate the aircraft hull (in cases where the aircraft fuselage remains intact) and with the right equipment (such as fire drills and snozzles), can also assure a more survivable environment during evacuation. New regulations for low heat release panels in aircraft will mean that passengers will survive cabin fires that previously would have killed them. This will effectively mean that more people will be in need of rescue.

3.24 In many accidents, the aircraft hull will be disrupted by impact such that the ARFF role is to suppress fires around those evacuating or needing rescue. In such a situation, passengers are more likely to be immobile and in need of rescue. This was the case at Sioux City in 1989 and Faro in 1992. The inference that ARFF did not assist in the rescue of passengers at Sioux City is insulting and patronising. Sentences such as "The fires inside the cabin continued to burn out of control for over two hours" are largely irrelevant and can be grossly misleading. The wreckage at Sioux City covered a wide area and where there was no chance of recovering survivors, there is minimal benefit from extinguishing fires. Indeed, ARFF personnel at Sioux City were most likely, and rightly, concentrating their efforts on rescuing the survivors and were subsequently applauded for their emergency plan and co-ordinated response.

4. Response Time

4.1 In para. 2.16, Smith states that ARFF have "...a near impossible task to meet the response times and fulfil their expected roles. In other words, airport fire services have an infinitely greater chance of apparently failing to meet expectations than they have of actually succeeding in actually saving lives". It is unclear how Smith rates 'success' and 'failure', but then suggests in para. 2.17 that "...even the best response times (25 to 60 seconds at Manchester for all units) seemed to make little difference in survival terms". 82 people survived the Manchester air disaster; it is likely that most, if not all, would have perished if the ARFF had not arrived when it did. To describe their contribution as making very little difference in survival terms is disgraceful.

4.2 In referring to the evacuation trials conducted under Prof. Helen Muir at Cranfield (para. 2.18), Smith states, "Still the basic premise is correct, the quick and the dead (sic) or the lucky (survive) but all without assistance". (Note. This sentence did not seem to make sense in the Smith report and has been interpreted.) The Cranfield study did not claim to include the role of ARFF as a factor, or indeed factors such as a disrupted fuselage. Therefore to use these trials to support his argument regarding 'outside assistance' is unfair. There seems to be confusion between the ARFF role in knocking down a fire around an undisrupted fuselage to allow able bodied passengers to evacuate themselves, and their role in both firefighting and rescue where a fuselage has been disrupted by impact (and generally, by definition, passengers are less able to evacuate themselves).

4.3 Therefore the comments regarding "...banning firemen from attempting to enter a burning aircraft in a crash situation" (para. 2.20) are only applicable in situations where the fuselage has not been disrupted. In situations such as the Manchester B-737 fire, the firefighters would have been better off using fire-drill or snozzle style equipment for attempting to control the cabin fire rather than trying to enter the cabin. However in situations such as the DC-10 crash at Faro in 1992 and at Sioux City in 1989, the fuselage was severely damaged and firefighters needed to enter parts of the fuselage to rescue immobilised casualties.

4.4 The response time on the part of ARFF is of critical importance to flight crew and cabin crew who, in the event of a fire, are dependent upon the ARFF to knock down fire to clear evacuation paths. Smith is keen to highlight how, in many accidents, passengers and crew evacuate themselves, but fails to acknowledge the time critical role played by ARFF. Municipal fire brigades, even with the best will in the world, simply cannot meet ICAO response times or beat the burn-through times of most aircraft fuselages. For a cabin fire such as the Manchester B-737 accident, firefighting equipment is of minimal use if it arrives more than a few minutes after the fire started. At Manchester, fire began penetrate the cabin between 13 to 22 seconds after the initial explosion. The fact that so many people survived (82) is largely attributable to the timely response of the ARFF. ICAO's push towards a response time of 2 minutes clearly recognises the need for a fast response to maximise preservation of life, something which only a dedicated ARFF is capable of delivering.

5. Crash Firefighting Effectiveness and Benefits

5.1 In para 2.27a, Smith refers to 14 major accidents where there was

"...no effective preservation of aircraft hull value and therefore no benefit accrued from the airport fire service other than the eventual suppression of fires". As the only accidents referred to are fatal, hull-loss accidents, it seems most likely that these aircraft were going to be severely damaged. By limiting the analysis to these accidents, no attempt is made to include non-fatal accidents or incidents where the aircraft was saved without a hull loss or fatality. To take this to its extreme, the argument expressed in para. 2.27a suggests that for an incident to be evaluated for the effectiveness of ARFF in preserving the aircraft hull, by definition, it needed to be a fatal accident!

5.2 As discussed above, para. 2.27b continues to suggest that 'rescue' functions are limited to entering burning fuselages, ignoring the likelihood of disrupted fuselages in aircraft crashes.

5.3 Para 2.27b claims that the review of US accidents is "conclusive" that "...outside the boundary, airport fire services will arrive too late to protect passengers and escape exits and, therefore, they are not effective, except in extinguishing any fire which may be a danger to property". When B-737 G-OBME crashed short of East Midlands Airport in 1989, the airport ARFF responded to the off-airport accident and extinguished a post-accident fire which could have spread to the cabin where 74 of the 79 survivors had suffered serious, and often debilitating injury. In the absence of the airport ARFF, the nearest manned fire station was in Loughborough, some 11 miles away. Municipal firefighting department do not carry enough foam or supplementary agents to extinguish large petroleum based fires. Municipal fire departments also do not have trained personnel for aircraft rescue or firefighting. This includes knowledge regarding, door operation, composite materials and associated hazards.

6. Public Beliefs

6.1 In para. 2.95 Smith tackles what he describes as the "...supposed public 'belief' that there is a rescue and firefighting service on all airports that will save them in a crash situation". Thankfully he acknowledges that his counter-contention that "...the vast majority of the air travelling public have never thought about the question, do not care one way or the other, or the more reasoning travelling public know a fire service is there and wonder why, when aviation is so safe." is equally invalid.

6.2 The comment about "...claiming to know the public's state of mind" having no relevance in the determination of policy may have some validity. However, it is suggested that CASA commit some resources to determining

what the travelling public do perceive.

6.3 The safety (or risk-taking) behaviour of individuals is highly dependent upon a unique (and, arguably, dynamic) set of factors. Put rather more simply, "People respond to the hazards they perceive." (Slovic, Fischhoff and Lichtenstein, 1980.) While the outcome of any risk taking decision is not directly related to an individual's perceived risk, it is this perception on which decision making is based. Indeed, even at policy making level, the meeting of perceptions have an extremely powerful impact on the result. For example, objections to the building of nuclear facilities tend to be disproportionate if solely compared to the hazards calculated through quantitative risk assessment (QRA). It is the fear and dread of catastrophic events that has a significant effect on the perception of risk. "If ...perceptions are faulty, efforts at public and environmental protection are likely to be misdirected" (Slovic et al. 1980).

6.4 It is unreasonable to believe that a mass change in perceptions regarding aviation safety is going to happen quickly through even the most intensive education campaign. Therefore, a more scientific and accurate survey of passenger and crew perceptions and expectations is strongly recommended for consideration by the CASA Board which represents them. What the public think is important, even if the aviation community believes it to be wrong. After all, it is the public that make up the industry's customers. The "we know best" attitude within paras. 2.95 to 2.99 are rather disturbing and would do little for trust between them and the aviation industry.

7. Costing of Accidents

7.1 Traditional cost-benefit analysis of accident risk has focussed upon fatalities rather than serious injuries. A number of, always controversial, attempts have been made to put a nominal value on human life for the purposes of cost benefit analysis. However, the cost of serious injury is rarely calculated and although in many ways even serious injury may be considered preferable to death as an outcome, it may turn out to be considerably more costly. Burns victims for example may need years of specialist treatment at significant cost and that is separate to the issue of litigation. It is recommended that cost benefit analysis of ARFF provision includes consideration of the cost of serious injury, not just death.

8. Future Concerns

8.1 Aviation is continuing to evolve and whilst advances have reduced risk in some areas, they have revealed new risk in other areas.

8.2 Passenger profiles are changing such that evacuations are becoming more difficult and certification standards more dubious. Whilst US FAR 25.803 requires "A representative passenger load of persons" which includes "(ii) approximately 5% must be over 60 years of age ..." In research conducted over 519 precautionary evacuations between 1988-1996, Hynes (Air Safety Week, 1998) found that "...nearly 30 percent of passengers involved in precautionary evacuations were over 60 years old."

8.3 Aviation continues to grow at a significant rate. International scheduled passenger numbers are expected to grow at an average rate of 5.5 percent per annum between 1998-2002, according to the latest IATA Passenger Forecast published in September 1998. As global accident rates for RPT jet operations have remained almost static since the early 1970s, the effect of growth is an increase in the absolute number of aircraft accidents. Estimates suggest that by 2010, the World can expect an average of one wide-body hull loss per week. Increased traffic growth in Australia may well mean an increase in ARFF cover, including reinstatement of services at airports such as Maroochydore, Hamilton Island and Yulara. A balanced review of ARFF is recommended by the CSWG which should include consideration of increases as well as the no-change and reduction options

8.4 Advanced technologies are not always adopted as quickly as some may think. Following the Manchester accident, some changes in cabin and seating materials were made, but retrofitting was limited and many aircraft older than 1985 still operate. 'Fire-Drills'/-lances are only just starting to be adopted by ARFF and both cabin water sprays (which would rely on back-up by a ARFF tanker to be fully effective) and passenger smoke hoods have fallen by the wayside. In spite of research advances in cabin layouts to aid evacuation, Australia still has many aircraft with, arguably, worse configurations than the B-737 G-BGJL at Manchester. The crucial point is, that if a similar accident happened today, the technological advances have been relatively minor and survival would continue to be dependent upon the response of the ARFF.

8.5 The next generation of ultra-high capacity aircraft (such as the Airbus A3XX) seems a certainty sooner or later to meet capacity demands. Such aircraft bring new problems in areas such as evacuation which should not be casually disregarded. The A3XX design may be likened to the main deck capacity of a B747-400 with an A340 fuselage mounted on top. Whilst the FAA require that the evacuation of both decks be considered separately for certification purposes, in reality the two decks are not mutually exclusive. The effect of evacuating two decks through inflatable slides is

that most of the aircraft fuselage needs to be clear for the slides to be operated. Without direct, timely intervention by ARFF in the event of a fire, this is unlikely. The A3XX will carry 555 passengers in three class 'very long range' configuration, potentially rising to 800 in Asian full economy configuration and carry 307 tonnes of fuel. Further, evidence from the introduction of new aircraft technologies is that 'learning' accidents occur due to e.g. inadequate training and lack of systems knowledge. This was the case with the DH Comet, B-707, B-727 and the A-320, all of which had been certificated as safe to fly. This does not appear to have been accounted for in Smith's analysis of either crash risk or his suggestions about category 10 aircraft only accounting for a small number of aircraft (para. 2.14, page 3-57).

8.6 To effectively rebel against the ICAO recommendation for category 10 without detailed analysis of the new threats posed by the paradigm shift in operating that the A3XX will bring borders on the reckless. The concept of an ultra-large aircraft crash has the potential to fundamentally change the entire aviation industry. The media response to an A3XX loss will most likely be of a level yet to be experienced. Whilst it is true that more people die on the roads in the US in a month, perception of disaster does not work like that. Whilst there is little point in introducing category 10 cover before the A3XX is built, to rule such cover out on the weak analysis within the Smith report would be extremely foolhardy.

8.7 Australia is unusual in terms of its length of international services with ultra-long haul sectors such as Los Angeles to Sydney operated by B747-400s close to their maximum range capabilities. This means that aircraft are taking off close to their maximum takeoff weights with full fuel tanks and often a full complement of passengers and crew. In such circumstances, the risk is heightened, especially as the weight of such aircraft would reduce their ability to cope with emergencies such as a rejected takeoff or engine failures. Whilst such operations are legal, they do represent a greater risk than operations well within an aircraft's performance envelope.

8.8 Although Smith pointed out that marine rescue was not detailed in the review, the CSWG wish to highlight this issue for consideration in any future review of ARFF. The location of Australian airports means that a high proportion of takeoffs and approaches are over water. This is set to increase as environmental pressures are applied and operations over water increase for noise abatement purposes.

8.9 The CSWG also warns that any changes in the area of ARFF should be viewed in the context of other changes which are imminent or planned within the aviation system. One example would be the proposal within NPRM 9809RP concerning CAO 20.16.3 para 6/121/.49 where the ratio of Flight Attendants

to passengers is proposed to be raised from 1 to 36, to 1 to 50. Whilst this is not inherently dangerous, it has the effect of reducing the number of staff on the aircraft to assist in evacuations. The research conducted under Prof. Helen Muir at Cranfield University in cabin evacuations found that evacuations were most successful when there were two assertive cabin crew at each door.

9. ICAO Recommendations

9.1 Data cited in para 3.14 are inaccurate and misleading. By using only fatal accidents, non-fatal major accidents involving B-747 around airports (e.g. overruns at Kai Tak and Tahiti) are ignored. The loss of a China Airlines A300 at Nagoya (1994) is omitted, as is the DC-10 at Faro (1992), and the DC-10 overrun at Fukuoka (1996). Aircraft accidents are rare events, therefore conclusions drawn from even 24 years since 1974 should be approached with caution. There is no reason why the trend of accidents should follow this same pattern in the future, even though there is considerable knowledge regarding risk profiles.

9.2 According to Boeing (1996) 61% of hull loss accidents (1959-1995) occurred in the loading, taxi, takeoff, final approach and landing phases of flight. Hewes and Wright (Ashford and Wright, 1992) observe that "Fifteen percent of all accidents occur in the airport approach areas, usually within 15 miles of the airport. ...These accidents are of primary concern to community emergency services; however, due to the fact that most community structural fire equipment is not very effective on large fuel fires, the airport's rescue and fire fighting personnel will usually respond under a mutual aid agreement." Further, the authors, who are well respected in rescue and firefighting and airport engineering, add, "The remaining 80% of recent accidents took place on the active runway or its overrun areas and clear zones. A plot of accident locations shows that almost all of these accidents occur within 500 ft of the active runway centreline and 3000 feet of the runway thresholds."

9.3 Smith suggests in para. 2.15 that there is "...20% chance only that (a) major crash will be on or near some airport". This figure seems significantly different to those expressed by Boeing and Hewes and Wright, and may be function of the fact that Smith is referring to "...2% of the world jet fleet being the largest aircraft having a major fatal crash". Once again, the sample of accidents is conveniently limited by the outcome being "fatal". The aim of ARFF is to prevent fatalities, indeed, it should be a common goal of all in aviation. For the 20% figure to be based on the sample of 14 fatal B-747 accidents mentioned in para. 3.14 is misleading at best. According to Airlife statistics, there were 22 fatal accidents

involving B-747 aircraft between 1974 and 1996 inclusive (this excluded the more recent B-747 accident in Guam). Of these 4 were acts of sabotage or aggression, the remaining 18 accounted for 2709 fatalities.

9.4 In para. 3.14, Smith also suggests that the "...most recent accident found involving a larger passenger aircraft where success for an airport fire service might be claimed was 20 years ago in 1978". How Smith defines 'success' is unclear. It seems that on account of the data used by Smith in section 1.6, only accidents where fatalities occurred are considered and from inference regarding the DC-10 crash at Sioux City (para. 3.14), a success is where the fire was extinguished. The fact that "...despite pre-warning of a likely crash, fires continued to burn for two hours after the accident" is irrelevant. In catastrophic accidents such as this, the ARFF priority is to knock down fires which threaten survivors and rescue them from the wreckage, rather than extinguishing all fires.

10. Concluding Remarks

10.1 The Asia-Pacific Cabin Safety Working Group has serious concerns regarding the methodology used in the Russell Smith report and some of the conclusions it draws. Many of these concerns have been highlighted in this response and it is requested that CASA give them the full consideration that they deserve.

10.2 Aviation Rescue and Fire Fighting has an extremely important role to play in Australian aviation safety. This response has concentrated on their core function of aircraft accident rescue and firefighting, but acknowledges that multiplicity of roles which ARFF also has in areas such as training and dealing with hazardous materials.

10.3 On the basis of the evidence presented in the report, the Group believes there is a need for a more balanced, in-depth review of ARFF to be carried out before changes like those recommended in the Smith report, are embarked upon. This should include a scientific, expert analysis of risk in the context of the evolving aviation system. This may also include a definitive study of passenger and employee expectations regarding ARFF cover.

The members of the Asia-Pacific Cabin Safety Working Group are keen to assist in such a review, to ensure that the Australian aviation industry remains a world leader in safety.