THE AASK DATABASE: A Database of Human Experience In Evacuation Derived from Air Accident Reports.

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1 ABSTRACT

Computer based mathematical models describing the aircraft evacuation process have a vital role to play in aviation safety. However, such models have a heavy dependency on real evacuation data. The Fire Safety Engineering Group of the University of Greenwich is undertaking a large data extraction exercise in order to address this issue. This paper describes the extraction and application of data from aviation accident reports. To aid in the storage and analysis of the raw data, a computer database known as AASK (Aircraft Accident Statistics and Knowledge) is under development. AASK is being developed to store human observational and anecdotal data contained in accident reports and interview transcripts. AASK currently contains information from 25 survivable aviation accidents covering the period 04/04/77 to 06/08/95, involving some 2,415 passengers, 2210 survivors, 205 fatalities and accounts from 669 people.

2 INTRODUCTION

The ability to unload passengers quickly is not only important to the efficient day-to-day operation of aircraft, it is an essential requirement in the event of an emergency incident. The layout of the passenger compartment, the nature of the passenger population and crew procedures are some of the essential ingredients that need to be considered when designing aircraft interiors. Furthermore, to assess the risk to human life under emergency conditions, the prediction of the physical, psychological and physiological responses of the passengers is also required. While physical experimentation with human volunteers provides a means of obtaining some of this information, this process poses considerable ethical, practical and financial problems [1].

Nonetheless, full-scale evacuation trials using human volunteers are the norm throughout the aviation industry. Indeed, despite its many shortcomings, the so-called “90 second” full-scale evacuation demonstration is mandatory for all new aircraft designs [1,2]. However, in recent years the shortcomings of these trials have been recognised [2] and this has sparked interest in the development of computer based aircraft evacuation models.

Computer based mathematical models describing the aircraft evacuation process, such as airEXODUS [1, 3-7], have the potential of addressing the shortfalls associated with full-scale evacuation demonstrations and have a role to play in the design and development of safer aircraft, implementation of safer and more rigorous certification criteria, improved crew training and accident investigation.

Associated with the development of computer based aircraft evacuation models is the need for comprehensive data collection/generation related to human performance under evacuation conditions. Factual data regarding the evacuation process is essential to the development of computer egress models. airEXODUS [1, 3-7] and other aircraft egress models [8-11] have a high reliance on factual data [12] regarding the evacuation process in order to:

(a) Identify the physical, physiological and psychological processes that contribute to, and influence the evacuation process and hence formulate appropriate models.
(b) Quantify attributes/variables associated with the identified processes.
(c) Provide data for model validation purposes.

Three forms of existing data are useful in providing some of the required information. Aircraft accident human factors reports produced by for example the NTSB and the AAIB, 90 second certification data held by the aircraft manufacturers, and large-scale experimentation devised to answer operational questions.

While data from all these sources is currently being studied by the authors, this paper concentrates on the analysis of aircraft accident human factors reports from the NTSB and AAIB. In the course of this study, it was found that, contrary to original expectations, a vast amount of human observational and anecdotal data was available. However, due to its nature, this data is extremely difficult to secure and analyse. To aid the storage and analysis of this data, a computer based relational database known as AASK (Aircraft Accident Statistics and Knowledge) is currently under development.

Of the data currently inspected, one accident report produced by the AAIB and 24 from the NTSB (see reference [13] for a full listing of accident reports) were considered suitable for this study. AASK currently contains information from 25 survivable aviation accidents during the period 04/04/77 to 06/08/95, involving some 2415 passengers, 2210 survivors, 205 fatalities and accounts from 669 people. Once secured, the analysis of the reports revealed a wealth of previously untapped data from passenger interview transcripts. While this type of data is unlikely to aid the quantitative analysis of parameters (i.e. point (b) above), or the validation process (i.e. point (c) above), the qualitative information is of considerable value in identifying the key processes influencing evacuation (i.e. point (a) above).

3 THE AASK DATABASE

The main purpose of AASK is to store observational and anecdotal data from the actual interviews of the occupants involved in aircraft accidents. In this manner, it enforces a more rigorous approach when analysing the individual accident reports, and then provides a useful framework from which to conduct cross accident analyses. The following sections describe the development of AASK and some analyses performed using it.

3.1 AASK Development

The initial AASK feasibility study involved a highly detailed study of a small number of accident reports that were comprehensive in terms of the human factors data provided. The principle aim of the study was to ascertain if a set of common behaviours and observations existed in the accounts. If such sets could be found, then the data could be placed into a relational database form, thereby increasing the potential for in-depth analysis. If successful, such a system could also be used as an aid to the interview process in future accident investigations, by allowing the investigator to ask **additional**, more directed, questions as well as the usual form of "*what happened?*".

In order to gain a general overview of the range of data available, the choice of accidents in the feasibility study was important. The information available in the reports had to contain detailed human factors data and represent a range of accident scenarios. For this reason, the reports available were categorised into one of 10 groups. Each category described the general nature of the accident as a function of hull integrity (ruptured or complete), presence and position of fire (internal or external origin), and the final resting terrain of the hull (in water or on land), based on those described by Schaefers [41]. Further categories include in-flight fires and collisions.

Initial analysis indicated that trends did exist in terms of the responses provided by the accident survivors, suggesting that the AASK database concept was viable. The initial development of AASK followed an iterative cycle, upon examination of the occupant accounts, each observation or behaviour type not previously accounted for was added to the database. For reasons of flexibility in terms of database management, AASK was developed in the database management system (DBMS) Microsoft Access. The initial design attempted to encapsulate all the data stemming from the reports, but rapidly became overwhelmingly complex. For this reason, AASK was split into four component databases:

(1) The ***ACCIDENT*** database stores information relating to the physical aspects of the accident. The data is solely of a factual nature, and is generally abstracted from the technical reports concerning the accident.
(2) The ***FA*** (Flight Attendant) database stores information relating to the observations, actions and performance of the FAs.
(3) The ***FATALS*** (Fatalities) component stores information relating to any fatalities. In general, due to the sensitive nature of this information, only very limited details are made available.
(4) The ***PAX*** (Passenger) database stores the passenger account details. This is the largest component of AASK, due to the wealth of information available, and forms the main component of AASK. There are six main sections in the PAX component, Physical details, Starting conditions, Reaction to alarm, Egress details, Egress conditions and Exiting details. Passenger anecdotal information may also be stored in this component.

In order to preserve and aid analysis of the data in AASK, a fifth database (ANALYSIS) has also been constructed. This simply utilises all the tables from the component databases without risking the integrity of the core data.

3.2 Example Analyses Performed Using AASK

The AASK database can be used for a variety of purposes. The type of analysis performed is dependent on the nature of the questions posed to the database. Thus, the uses of AASK are far greater than those originally envisaged by its developers. In this section, a number of analyses performed using the AASK database will be presented. However, none of the analyses presented in this section should be considered to be complete as they are based only on a sub-set of the available data. A more complete analysis may be found in reference [13].

3.2.1 Survivor And Reply Rate Analysis

The first example analysis examines all the available accidents and displays some basic statistics for those where individual passenger accounts are available. Of the 25 accidents currently held in AASK, 17 were found to be suitable for this analysis. The accidents cover the period 23/1/82 – 8/6/95 (shown in Table 1).

Table 1: Basic survival and reply rates analysis where individual pax accounts are available

Date	Aircraft	Location	Pax	Pax Load	Surv. Rate	Reply Rate	Accident Type
01/23/82	DC10	Logan INT. A/P Boston	197	55%	99.0%	3.1%	Ruptured, In Water
09/01/83	CV580	Brainerd A/P, Minnesota	30	60%	96.7%	69.0%	Intact, No Fire
02/06/83	DC9	Greater Cincinnati Int. A/P	41	41%	43.9%	77.8%	In-flight, Internal Fire
08/22/85	B737	Manchester A/P England	131	96%	59.5%	96.2%	Intact, Internal Fire
10/25/86	B737	Charlotte Douglas Int.A/P	114	66%	100.0%	99.1%	Intact, No Fire
11/15/87	DC9	Stapleton Int. A/P, Colorado	77	93%	67.5%	76.9%	Ruptured, No Fire
04/15/88	DHC8	Seattle-Tacoma INT. A/P	37	100%	100.0%	75.7%	Ruptured, Ext Fire
10/08/88	B737	Little Rock Arkansas	102	94%	100.0%	31.4%	Intact, Ext Fire
08/31/88	B737	Dallas Fort Worth Int. A/P.	101	68%	88.1%	91.0%	Ruptured, Ext Fire
09/20/89	B737	LaGUARDIA A/P NY	57	39%	96.5%	50.9%	Ruptured, In Water
10/14/89	B727	Salt Lake City Int A/P	12	8%	100.0%	66.7%	Intact, Ext Fire
12/30/89	B737	Tuscon INT. A/P	128	100%	100.0%	24.2%	In-flight, Internal Fire
03/12/90	B727	Detroit Michigan	40	27%	82.5%	54.6%	Ground Collision
01/30/91	BAe31	Raleigh County Mem A/P	17	89%	100.0%	82.4%	Intact, Ext Fire
04/14/93	DC10	Dallas Fort Worth Int A/P,	189	53%	100.0%	49.7%	Intact, Ext Fire
04/26/94	MD82	LaGUARDIA A/P NY	110	75%	100.0%	12.7%	Intact, No Fire
08/06/95	DC9	Hartsfield Int. A/P, Atlanta	57	50%	100.0%	63.2%	Intact, Ext Fire
04/04/77	DC9	New Hope Georgia	81	81%	26.0%	81.0%	Ruptured, Ext Fire

This analysis, while quite simple, illustrates some of the benefits and dangers of using this type of system. This simple query allows an overview of the data available for analysis. The response to the enquiry is precise and was obtained in seconds. A traditional approach to retrieving this type of information from a large source of data would have taken quite some time and subject to errors. However, the results of the analysis must be tempered with the knowledge of the question posed. From the results displayed in Table 1 it appears that the survival rate is quite high, ranging from 43 – 100%. However, this data is biased as only those accidents where individual accounts are available are included, suggesting that a fairly high survival rate would be required in order to generate enough replies.

Furthermore, the variability in reply rates is high. The reply rate simply represents the number of questionnaires returned to the authority as a proportion of the survivors, i.e. the number of passengers for which data exists. The average reply rate is 60.3%, which may seem quite high however, this suggests that nothing is known of the remaining 39.7% survivors. For certain types of questions, knowledge of such statistics may be vital in order to establish whether or not the data represents a fair cross-section of all the data. For example, the 39.7% of the survivors not returning questionnaires may have exhibited behaviour that greatly influenced the outcome of the evacuation.

Finally, while these analyses included all accidents currently in the data base in which there were survivors, the analyses could have been restricted to any number of relevant controlling influences, for example, accidents involving fire, accidents involving runway over shoot, accidents involving wide body aircraft, charter flights, etc.

3.2.2 Analysis Of Nearest Exit Usage

A commonly held belief concerning building evacuations is that most of the occupants evacuate via their most familiar exit, thereby ignoring closer but unfamiliar emergency exits. While anecdotal data tends to support this belief for buildings, the same cannot be said for aircraft, yet within the aviation safety industry, this is a commonly held belief. AASK can be used to explore the occurrence of exit usage and determine whether passengers tend to use their nearest serviceable exit or their boarding and hence most familiar exit.

While it is not possible to store exact distances that passengers travel during an evacuation, a simple distance system has been implemented in AASK using the number of seat rows as a distance measure. When specifying the starting location of the passengers, not only is the seat label required, but also the absolute seat row from the front of the aircraft. The positions of the exits along the cabin are also stored in terms of seat rows. Thus knowledge of the starting location and the exit used by passengers allows a crude measurement of the distance travelled.

An analysis involving 17 accidents and 542 passengers who reported their exit usage (41% of the survivors) reveals that only 135 passengers (25%) did *not* use their nearest exit. Of the 135 passengers that did not use their nearest exit, 48 passengers supplied reasons for their actions. Examination of the reasons supplied by these passengers reveals the following; 22 passengers followed instructions from a flight attendant, 11 passengers followed other passengers, 6 passengers thought the nearest exit was blocked, 5 passengers chose to redirect due to congestion at their nearest exit, 1 passenger reported a fire in the vicinity of his nearest exit.

While by no means complete, this analysis suggests that an overwhelming 84% of those passengers reporting their exit usage, either used or had a good reason not to use their *nearest exit*. The remaining 16% did not supply any reason for not using their nearest exit, however, this is not to say that they did not have a reason. Of all the passengers in AASK, only a single reference is made to the boarding exit, by an elderly female who initially travelled aft to her nearest exit, realised it was blocked and decided to go forward to the boarding door, eventually escaping from an overwing exit.

It is also interesting to consider the direction travelled by the passengers when evacuating. Table 2 shows that of the 542 passengers for which we know the direction of travel, 70% travelled forward, 23.6% travelled towards the rear while the remainder where situated within an exit row. This may suggest that the passengers have a propensity for travelling forward. However, of those passengers choosing to travel forward, 72.4% have selected their nearest exit, while for those choosing to travel towards the aft, 73.4% have selected their nearest exit. This suggests that the overriding ambition of the passengers is to exit via their nearest exit, rather than to travel forward. In addition, this suggests that exit selection is based on a rational decision, at least for the survivors.

Table 2: Direction of travel and distance travelled for 542 passengers where starting locations and exit usage is known

Direction	No. Passengers	Min Distance	No. Passengers	Mean Distance (seat rows)
Forward	379	True	278	4.3
		False	101	8.7
Aft	128	True	94	4.0
		False	34	7.8
Exit Row	35	True	35	0.0

The mean distance travelled (in terms of seat rows) by survivors in evacuating is 5.4 seat rows. Furthermore, those passengers who select their nearest exit travel approximately 4 seat rows regardless if they travel forward or aft while those who do not travel towards their nearest exit travel approximately twice as far (see Table 2.). This type of analysis provides essential insight to computer modellers attempting to simulate the evacuation process. It also provides a means for challenging the 'myth' concerning exit usage. Most importantly however, this type of analysis is extremely valuable in aiding our understanding of the behaviour of people in real accidents.

The finding concerning exit usage may have implications for flight attendant procedures. It is known that flight attendants are able to exert a considerable influence on passenger behaviour during an evacuation under controlled experimental conditions [43-46]. However, in real emergency situations, where passengers may have a choice of directions in which to escape, they may ultimately ignore attendant commands and attempt to use their nearest exit. This is an area requiring further investigation both through the historical record and through controlled experimentation.

While a more complete database is required before any firm conclusions may be drawn, this analysis highlights the usefulness of the AASK database for evacuation model developers and safety engineers. Analyses such as this not only supply data useful in understanding passenger behaviour, but also in suggesting further areas of research.

3.2.3 Exit Distribution Analysis

As an extension to the previous analysis, it is possible to examine the exit usage in terms of exit location. However, in order to perform analyses involving different aircraft types and layouts, a generalised form of exit location labelling must be adopted. For this reason, AASK considers three generalised exit locations, FWD (exits at the front), MID (exits in the overwing area) and AFT (exit at the rear of the aircraft).

The previous analysis found that the passengers had a propensity to use their nearest or perceived nearest, exits. Depicted in figure 1 is the direction of the expected flow of passengers in an aircraft with three exit pairs given that the passengers use their nearest exits. This quite clearly shows that in this kind of situation, there would be a heavy bias for the exits positioned in the midsection of the aircraft. Of the accidents in AASK, three were found to be suitable for analysis. The selection criteria required that at least one exit of each exit pair in the aircraft was available during the evacuation. The results from the analysis were normalised so that the *percentages* shown represent the percentage of the passenger population using the particular exit. It is important to note that no passenger fatalities were reported in any of these accidents. Table 3 displays the results from this analysis. This analysis suggests that a bias in exit usage exists for the MID exits. The observed bias remains even if the last accident [35] – which only has a passenger loading of 39% - is removed from the sample. For the aircraft with three exit pairs this is a disturbing trend as the MID exits are the smaller TYPE-III passenger operated hatch exits.

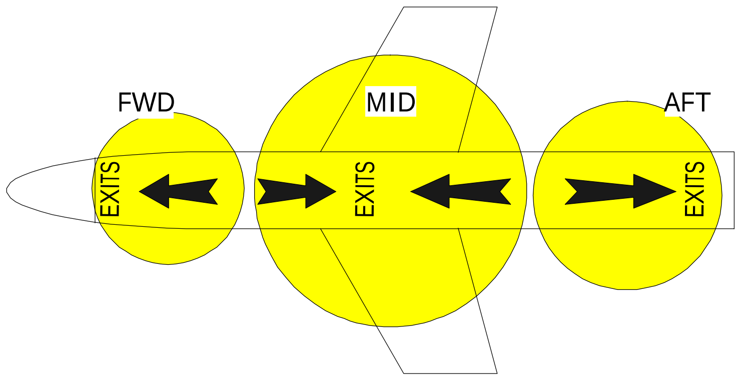

Figure 1: Likely exit usage distribution for an aircraft with three exit pairs

Table 3: Exit usage in terms of percentage of paxs using each generalised exit position. Information in brackets identifies exit type.

Accident	Pax Loading	Fwd (%)	Mid (%)	Aft (%)
[29]	94%	25.0 [I]	53.0 [III]	22.0 [I]
[33]	66%	32.5 [I]	42.5 [III]	25.0 [I]
[35]	39%	38.0 [I]	54.0 [III]	8.0 [I]
Mean		**31.8**	**49.8**	**18.3**

The results from this analysis may be compared with exit usage attained during the industry standard 90-second certification trial [46]. An analysis of this type would highlight how closely exit usage in these trials represent that found in actual accidents. It is important to note that the 90-second certification trial is intended to be an industry bench-mark against which aircraft designs are compared and tested. However, the 90-second certification trial scenario is not intended to represent a real life situation. Furthermore, it is important to note that results presented in Table 3 only refer to four accidents and so is by no means complete.

Exit usage for two aircraft with three exit pairs, derived from actual 90-second certification trials, is presented in Table 4. Examination of the data for aircraft with three exit pairs suggests that the exit usage achieved in certification trials is quite different from that in actual accidents. In actual accidents, there appears to be a biased trend for exit usage in the midsections (i.e. the nearest exit for the majority of passengers) of the aircraft. Yet in the certification trials, the mean load on each exit pair is far more even and furthermore, fewer passengers use the midsection exits, the reverse of that seen in actual accidents.

Table 4: Generalised passenger exit usage for aircraft with three exit pairs in 90-second certification trials.

Aircraft	Fwd %	Mid %	Aft %
1	40	20	40
2	27	37	36
Mean (%)	**33.5**	**28.5**	**38**

The most probable reason for this lies in the behaviour of the passengers. Essentially, in a real accident the passengers have a higher motivation to escape and tend to do so by what they perceive to be the most direct method – their nearest exit. The FA procedures used in certification trials work quite well and achieve a well balanced evacuation with most of the exits working in an efficient manner. However, in these circumstances, the passengers are working in a highly co-operative manner as opposed to the competitive behaviour likely to be exhibited by passengers in life threatening situations. This suggests that formulating cabin crew procedures on the basis of certification experience may be misleading in terms of their actual effectiveness.

3.2.4 Exit Availability Analysis

In the previous two analyses, exit usage has been examined from a passenger perspective. In this final analysis, the exits that are actually available during the accident are examined. The accidents used in this summary ignore all those where substantial damage occurred to the aircraft fuselage, i.e. where significant breaks in the fuselage occurred, and include only those accidents where information is known about all the exits. As a result, 12 accidents were selected, each one involving an aircraft with three pairs of exits.

The frequency of exit availability for the aircraft involved in these 12 accidents is displayed in Table 5. At the FWD generalised location, one exit is available in only 25% of cases while both exits are available 66.7% of the time. In the case of MID positioned exits, the results are very similar, in most cases (58.3% of the time) both exits are available. Finally, the AFT positioned exits show the opposite trend, cases where both exits are available all of the time are least frequent (16.7% of the time), while cases where both exits are unavailable most of the time are most frequent (50%).

As part of the 90-second certification exercise, the trial criteria stipulate that only half of the available exits can be used. Without exception, where aircraft have exit pairs, only one exit of each pair is selected. If this scenario represented reality we would expect to see the highest percentages in the "One Exit" column of Table 7. Thus, the exit configuration used in the 90 second certification exercise does not correspond to the exit availability suggested in the sample of real accidents contained in AASK. Furthermore, the exit configuration actually used in the 90-second certification exercise is not a particularly onerous configuration as an exit is available in each cabin section. A more challenging exit combination that was also consistent with the observed exit availability would involve both FWD exits and a single MID exit. Once again it is important to note that results presented in Table 7 only refer to 12 accidents and so is by no means complete.

Table 5: Proportion of exit availability in terms of generalised exit positions.

	Availability (%) of exit in exit pair.		
Exit Position	**No Exits**	**One Exit**	**Both Exits**
FWD	8.3	25.0	66.7
MID	16.7	25.0	58.3
AFT	50.0	33.3	16.7

4 ANALYSIS OF OTHER DATA SOURCES

There are two further sources of potentially useful data that are also being explored by the authors in conjunction with the AASK accident analysis. The first of these is the aircraft manufacturers 90-second certification data, and the second is from small- and large-scale experimental trials.

4.1 Aircraft Manufacturers 90-Second Certification Trial Data

Data generated and collected by aircraft manufacturers through the certification process is of great benefit to those attempting to develop aircraft evacuation models. While the relevance of certification data to the development of models attempting to simulate evacuations under "*real*" conditions may be questionable, its relevance to the development of evacuation models capable of simulating certification conditions is obvious. Furthermore, in the absence of more relevant data, this information is vital.

However, access to this data is difficult due to its propriety nature. The authors in conjunction with the UK CAA have undertaken a study of the manufacturers' 90-second certification data. To date, AIRBUS INDUSTRIE, BAe, BOEING, Bombardier Inc and MDC have made their 90 second data available for study.

The data being extracted from this information is useful for all three of the areas described in section 2. For example, by studying video footage of certification demonstrations it is possible to collect information describing human behaviour such as:

- Do passengers encounter difficulty when entering the aisle from a seat?
- Do passengers queue in aisles? If so for how long and where did the congestion occur? What is the nature of the congestion? What was the cause of the congestion?
- Do passengers go over seat backs? If so, why? Exit and entry points noted.
- Do passengers recommit after selecting a particular exit?
- Is the behaviour of passengers under reduced lighting conditions significantly different to that expected under normal lighting conditions?

This information partially addresses the issue in point (a) of section 2. However, detailed analysis of video footage is most useful in quantifying attributes/variables used in the evacuation model, thereby addressing (b) to a large extent. For example it is possible to extract information relating to:

- How quickly passengers respond to evacuation call
- Estimates of passenger maximum travel speeds
- Estimates of delay times at exits

Finally detailed information concerning exit usage and evacuation times is useful for validation purposes.

Analysis of data collected for this study is proving invaluable not just for the development of airEXODUS but also for the manufacturers, providing them with a quantifiable insight into the performance of their systems [21].

4.2 Large- and Small-Scale Evacuation Experiments

The third source of existing data is provided by large- and small-scale evacuation experiments. Over the past six years, the UK CAA has sponsored a series of large-scale competitive evacuation trials from a single aisled aircraft using a single exit [20]. These trials were designed to answer specific operational questions concerning passenger behaviour relating to exit width and seat spacing at exits. This work has recently been extended to include competitive evacuations through multiple exits and the role of cabin crew intervention [18,19]. This research is on going and forms part of an international collaboration between the UK CAA and the USA FAA. Unfortunately, no detailed information of this type currently exists concerning competitive evacuations from wide-body aircraft.

To date most - if not all - the experimental effort in human evacuation research has been directed towards answering specific operational questions. Wherever possible this data has also been used to assist in the development of computer based evacuation models by providing insight into competitive human behaviour. More importantly however, they contribute to the general pool of data for model validation purposes. Thus, the data from this type of experimentation provides information that partially addresses item (c) in section 2 and to a lesser extent item (a). Information from the Cranfield trials for example is being used as part of the airEXODUS validation procedure. Other experimental research involving large-scale evacuation can provide detailed information to quantify essential model parameters and thereby address the requirements of item (b). For instance, recent work conducted by FAA CAMI has correlated the delay time associated with passengers passing through Type-III exits with weight, height and gender [22]. This data has been included within the airEXODUS model as part of the exiting procedure options.

In some cases, evacuation data stemming from the built environment may also be useful in the aviation arena. For example, the experiments conducted by Jin [23] allow an estimation of the effects of irritant smoke on evacuation performance, and the correlations produced by Purser [24] and Speitel [25] allow the effects of toxic products and heat upon people to be modelled.

5 CONCLUSIONS

Evacuation models have been suggested as a possible alternative to the current practice of performing full-scale certification trials. Furthermore, validated evacuation models have great potential in risk analysis, aircraft design, accident investigation and FA training. However, the reliance of these models upon data in order to develop, enhance and validate their capabilities cannot be underestimated. While there is a vast supply of data – primarily in the form of aviation accident reports - suitable for these tasks, this data is extremely difficult to collate and analyse in a coherent and efficient manner.

As demonstrated in this paper, the AASK database is one means by which this can be achieved. Indeed, the AASK database provides a versatile aid in the analysis of human experience in aircraft evacuations. While much data exists for input to the database, the data is limited in scope in that the qualitative aspects of the data far outweigh the quantitative. As such, conclusions drawn from the database must be treated with caution and with full knowledge of the implications of the questions posed and the nature of the data used to provide the responses. Quite apart from its use as a development tool for evacuation models such as airEXODUS, AASK is shedding light on what really happens during aircraft emergency evacuations and as such is helping to dispel some of the myths that pervade aviation safety. This type of analysis is vital if trends in passenger behaviour are to be understood and ultimately used to improve passenger safety. Through support from the UK CAA, work on AASK is continuing.

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