

Direct view for cabin crew members

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Introduction

The cabin safety research programme at Cranfield University was initiated by Professor Helen Muir and the United Kingdom Civil Aviation Authority in 1988, following the accident at Manchester in 1985. Since that time, numerous projects have been funded by regulatory authorities, manufacturers, suppliers and airlines. Much of the research capitalises on the world class facilities available at Cranfield University, which include a Boeing 737 cabin simulator, a double-decked wide-bodied modular cabin simulator, two flight deck simulators, eye-tracking equipment, and thermal and infra-red video recording facilities.

While the Human Factors Group is probably best known for its pioneering work in the field of passenger evacuations, the Group conducts applied psychology research across a range of fields within aviation and other safety critical industries. All of the Group's work focuses on areas where people have to interface with each other, with complex technology or equipment, or with organisational processes. One recent project was an investigation into direct view and passenger supervision by cabin crew members. This area of cabin safety is believed to be of critical importance with regard to future very large transport aircraft, especially considering the novel cabin features which may be configured into such aircraft.

The regulatory authorities require that each seat located in the passenger compartment and designated for use during takeoff and landing by cabin crew members provides an unobstructed view of the passenger cabin area for which that crew member is responsible. Direct view means "visual contact with cabin main area/aisles which enables the flight attendant to be made aware of passenger needs relative to safety when the flight attendant is seated", and this is intended to also mean when the cabin crew member is harnessed. Guidance material indicates that although the primary requirement is to ensure that the crew are in close proximity to an exit, "every practical effort should be made to eliminate obstructions to direct view" (FAA, 1994). Mirrors and other such devices are only acceptable where cabin crew proximity to a floor level exit takes precedence over direct view. Video systems are acceptable only where the level of conspicuity is equivalent to that which would be obtained with a direct line of sight.

Safety and security considerations, especially after 11 September 2001, have highlighted the need for the cabin crew members to be able to supervise passengers and monitor their behaviour. For example, Richard Reid, who attempted to detonate explosives hidden in his shoes, was thwarted when a cabin crew member saw him trying to light the explosives (BBC, 2002). Further, in an evacuation situation, such as at Manchester in 1985, it is important that the cabin crew have a view of the cabin in order to be able to supervise passenger preparation. In this accident, the forward cabin crew seats in the Boeing 737 were on the left hand side in the forward entrance vestibule, and the view into the cabin was restricted by a galley bulkhead. This made it difficult for the crew to see what the passengers were doing. The accident report states that "the inability of the forward

crew members to monitor conditions in the cabin from their takeoff and landing positions was unsatisfactory" (King, 1989, p101).

Many operators assess the direct view using a layout diagram of the cabin configuration, and this is generally accepted by the regulatory authorities. For example, one long-haul operator calculates the proportion of seats that can be seen, at least in part, from the eye reference point. The eye reference point naturally depends on the height of the crew member. The figures used by this operator assume the cabin crew member's height to be from 5'2" to 6'3". The measurement is taken from 4.7 inches forward of the crew seat, and assumes head movement of 8.5 inches either side of the centre. The line of sight is assumed to be limited to 160 feet. Using these guidelines, 80% of the total passenger seats must be visible, including at least 50% of the seats within each cabin zone or area. If this cannot be achieved, additional means are to be utilised.

Additional means to enhance direct view can be one of three options. The first option is design change. This refers to changing the design or function of bulkheads or partitions, which could include relocation or redesign. In this context, use of transparent panels, windows and shutters, or curtains and flaps could be utilised. The second option is to provide an additional cabin crew member seat, which would then enable the operator to meet the direct view requirements. However, since this would be required in addition to the previous number of seats, this option may not always be viable. Finally, mirrors and similar devices are permitted, but only where a design change or an additional cabin crew member seat is not possible (Kelleher, 2002).

Method

In order to examine the types of situations in which direct view has been invaluable to crew members, and the circumstances in which direct view has been less than optimal, this research involved exploratory work with cabin crew from a number of airlines. The work was qualitative, in that it involved the conduct of individual interviews or focus groups (group interviews) with members of cabin crew. The interviews followed a semi-structured format, so that the research team could ensure that the topics of interest were covered by every group. This included issues such as what crew members were looking for on takeoff and landing, what cabin crew members believed to be the current problems (if any) with direct view, and potential direct view problems in future aircraft types with novel cabin interiors. All interviews were tape-recorded and transcribed, and the contents of the transcriptions were analysed for specific themes and issues.

In total, interviews were conducted with 36 participants over a period of three days. Interviews were conducted either individually, or in one of seven focus groups with between two and eight crew members. In addition, a letter was received from a cabin crew member, which was included in the analysis. This brought the total sample size to 37 crew members, with experience ranging from two to twenty nine years. The aircraft types flown by the crew who were interviewed included Boeing 737, Boeing 747, Boeing 767, Airbus 319, Airbus 320 and the Airbus 340.

Discussion of results

The content analysis revealed that cabin crew members believed direct view during takeoff and landing to be of significance in a number of areas. Topics covered included monitoring the aircraft and passenger behaviour, security, incidents and accidents, obstructions to direct view, equipment difficulties and solutions, and innovations suitable for very large transport aircraft. Each of these areas is discussed in turn below, using illustrative quotes taken directly from the interview transcripts.

Monitoring the aircraft

Cabin crew members reported routinely listening to sounds both inside and outside the passenger cabin, particularly paying attention to any unusual noises. If they hear anything unusual or see anything that does not appear normal, then they alert the flight deck crew.

"I'm looking for... listening to unusual noises... unusual smells. Maybe the irregularity of the speed, you look for that... everything is secure in the cabin... Things like that are very important at this stage. ... You get to recognise noises, it comes with time. ... Anything you don't recognise, you report it straight away."

Many cabin crew members also reported doing a "30 second review" during these critical phases of flight. The cabin crew, while in their seats, anticipate what may go wrong, what they would do in such a situation, and what their commands to passengers might be. In doing this, they are able and ready to act in the unlikely event that there is an incident on take-off or landing.

Monitoring the passengers

The only time that cabin crew members are permitted to leave their seats during the critical phases of flight is to carry out safety related duties:

"The [senior crew member] makes a PA to say 'cabin crewmembers take your seats for takeoff or landing'. They will then phone the flight deck and say 'cabin ready' and then, depending on what aircraft, press a 'cabin ready' button, so all crewmembers should be seated at that time. Then, when takeoff is imminent the captain will flash the ... no smoking signs twice."

Having such a procedure in place ensures that the flight crew are aware of what is happening in the cabin, and vice versa. It also ensures that the cabin crew are seated at the point of takeoff and landing, reducing the possibility of injury to the crewmembers. However, it would appear that many passengers do not appreciate the meaning of such communications, and sometimes remain unaware of the criticality of these phases of flight.

During takeoff and landing, all of the participants interviewed reported listening to the noises in the passenger cabin, and being very aware of any noises that they associate with normal situations. In some cases, it was the unusual noises in the cabin that alerted the cabin crew members that passengers were moving, and not the direct view.

"You just get to know what passengers are like ... you sense, you hear noise, you hear lockers opening. ...but once you hear lockers opening you know someone has stood up. But I know from tendency that once you've landed, you look down."

In addition, some of the cabin crew members interviewed reported that other passengers' reactions could alert the cabin crew members that something was happening in the passenger cabin, for example, if there was a passenger standing up. Often, other passengers look around and start to mumble and murmur amongst themselves. This cue informed the cabin crew that something was not right, and they could then investigate. This would be done by either looking into the cabin, or informing another cabin crew member if they did not have a good direct view. The crew member who could see the passenger would then deal with the situation.

One of the main issues with passenger behaviour was the way that novice passengers or infrequent flyers leave their seats during takeoff and landing. For example, one cabin crew member reported a situation where the aircraft was on final approach to Orlando, Florida. The Captain made an announcement to the effect that if passengers looked out of the window on the left hand side, they would be able to see Disneyworld. Many passengers on the right hand side of the aircraft got up from their seats to go to the other side of the cabin. Novice passengers were also reported as frequently ringing the call bell during taxi, approach, takeoff or landing. This could be to ask for sweets, to ask a cabin crew member to retrieve something from the overhead lockers, or to use the toilets. The cabin crew members interviewed generally perceived the problem to occur because novice or infrequent passengers did not appreciate that they were required to remain in their seats during these phases of flight.

Another issue highlighted throughout the interviews was the behaviour of business passengers and frequent flyers:

"Businessmen are the worst, they are the worst. Because they know it all. ...They don't know that aircraft change all the time. They get quite complacent with it and think they know it all."

Such passengers may fly regularly, and yet many pay little attention to safety considerations. It was also reported that frequent fliers often did things contrary to what they were told in safety briefings, for example putting suitcases behind their legs, and putting their laptops on the empty seat beside them for takeoff and landing. However, the main direct view problem with business passengers appeared to be the use of mobile phones. Cabin crew members are not permitted to leave their seats until the aircraft has come to a complete stop at the gate. Hence, although they may be able to hear someone receiving a text message on their mobile phone, they are not always able to see them. When cabin crew members can see if a passenger is standing up, they can direct a comment at that passenger to sit down. The same is not always true when a passenger is using a mobile phone. Although not always used, an announcement over the public address system was reported as being effective because:

"it embarrasses them"

into sitting down again. There would be benefits in increasing the view that cabin crewmembers have of passengers, since this would assist in preventing inappropriate use of mobile phones.

Nervous passengers were also discussed during the interviews. Such passengers are often identified at check-in, in which case a note is made for the cabin crew to be aware that there is a nervous passenger flying. If they are not identified at check-in, cabin crew members can often spot nervous passengers as they board the aircraft, and are able to reassure them before takeoff. Nervous passengers were not reported as being difficult, and one participant stated that nervous passengers were often guilty of nothing more than ringing the call bell at takeoff and landing, perhaps looking for help and advice from the cabin crew on the noises the aircraft was making. However, if the aircraft hits some heavy turbulence, or if passengers experience something that they are unaccustomed to, the number of nervous passengers tends to increase to encompass all but the very experienced flier:

"...and you get a touch of turbulence, everyone looks at you! Don't they? ...They want to know, they want to see our faces, how we are reacting to the very bad turbulence. And that's from their own safety point of view. ... If they think we're fine carrying on then they go 'oh, it can't be that bad'"

Another member of cabin crew who was interviewed reported a situation where she was strapped in ready for landing, when she and her colleague heard noise and murmurs from the other passengers in the cabin. When they looked around, they saw an intoxicated passenger who had stood up. By shouting at him, the participant only managed to get him back to his seat just in time:

"we weren't getting out of our seats for him"

Since so many of the commands are given from the cabin crew members' seats, which are often separated from the passenger cabin by bulkheads, the bulkheads can muffle the cabin crew members voices and commands. With no direct view there is also no eye contact – a vital part of communication.

Security

In all of the interviews, it was apparent that the whole emphasis of cabin security has shifted since 11 September 2001. Security is now interpreted as meaning the prevention of terrorist acts. Since 11 September 2001, cabin crew regard their own roles, and the role of passengers, as involving the prevention of terrorism. All cabin crew members interviewed were very conscious of being extra vigilant, routinely watching out for strange behaviour from passengers.

"I had a guy checked out, he came on with no bags and he was really, you know he just strutted up and wouldn't say hello and he had no bags or anything"

Another participant reported a passenger who put his baggage in the overhead locker and then sat down. Soon afterwards he got up again, moved his luggage to another bin, and sat down again. Then, he got up again to move his baggage to another bin and resumed his seat. By this time, the cabin crew member had grown suspicious, and asked the ground staff to check the passenger. He was removed from the flight, and it was later discovered that he was checking the airline's aircraft security from a criminal/terrorist perspective.

Interestingly, the crew interviewed believed that passengers have a new role in security in the post 11 September 2001 environment, since it was believed that passengers would assist in preventing terrorist acts occurring. In fact, this is just as well, as many of the cabin crew members stated that they had limited view of the cabin and the passengers in it. If a passenger attempted to get to the flight deck during takeoff and landing, the cabin crewmembers would not necessarily be able to see them until they had reached the flight deck door. This was reported as the one and only situation where the cabin crew members would get out of their seats on takeoff and landing.

"If they're getting up and running, if you can't see, if you can't see until they get past that galley thing, that's when you get off your seat ..."

However, it was generally felt that the cabin crew should not be responsible for the security of the flight, since ultimately, terrorists should not be allowed onto the aircraft. It was observed that if a terrorist managed to get on the flight, there was very little that could be done to ensure the safety of the flight. Cabin crew members were quick to point out that in these situations, the aircraft is still vulnerable. For example, in the lavatory, passengers can be alone and completely unobserved.

Incidents and accidents

Although none of the crew members interviewed had experienced accidents, a number had experienced rejected takeoffs and aborted landings. One cabin crew member was on a flight where one of the engines blew out. The participant was sitting in the galley at the aft of the aircraft, and had no view of the wings or the engines. The passengers:

"freaked out, they could see flames coming out of the engines"

After the captain told the passengers that they had lost an engine, most passengers remained calm although some were reported to have panicked.

One of the cabin crew members reported an incident that a colleague had been involved in. On landing, the cabin crew heard a call bell. The cabin crew member assumed that it was nothing urgent, but looked into the cabin to check.

"The passenger had had a heart attack and managed to hit the call bell as he slumped over... because the cabin crew member was sort of nearby at the front she could, just then look out from her seat ... and see someone slumped over. But at that stage she really couldn't get out of her seat."

The cabin crew member had to wait until the aircraft had landed before she could get out of her seat to tend to the passenger. In another interview, cabin crewmembers reported the two methods available to assist passengers in such a situation. However, during takeoff or landing neither of method can be used, because they both require at least one crew member to be out of his or her seat, and the passenger to be lying in the aisle. Further, it is not permitted to operate the defibrillator at these times.

Direct view obstructions

There are two types of obstructions in the passenger cabin. The first are the fixtures and monuments installed in the aircraft, including the lavatories, galleys, bulkheads and wardrobes. In wide bodied aircraft, there may be two toilets installed in the middle aisle, which block the view on the other side. Galleys, wardrobes and some bulkheads are often used to hold emergency equipment:

"... a lot of the time, it's equipment that's blocking the view, ...there's cupboards with equipment in it that's blocking the view, it's not just the bulkheads"

Many airlines install emergency equipment in standard locations across different aircraft types to reduce the probability of confusion. To change the location of the galleys, wardrobes, and bulkheads may require the relocation of equipment, and it is preferable to keep the locations of such items standardised.

Another problem raised with direct view was that in first class there are often additional galleys, wardrobes and bulkheads to cater for these passengers. This in itself can make passenger supervision more difficult, as there are more installations to obstruct the view and ensure passenger privacy. On the other hand, airlines tend to ensure that there are more crew working in first class, to enhance the service that these passengers have paid for. However, cabin crew members also reported that their seats were sometimes obstructions to direct view. Often, they are facing away from the passengers in the cabin or are

"hidden in the galley"

One cabin crew member reported that to see into the cabin, she would need to loosen her safety restraint straps, and bend at an angle to see into the cabin. Often, cabin crew members said that because of the seat location in relation to galleys and lavatories, nothing could be seen from the seats. Despite this, cabin crew members were often confident that the entire passenger cabin would be visible to another crew member from another seat.

"Another crewmember might spot down the back because they're forward facing and they would ... get attention to another crewmember that somebody's out, there's a passenger standing up"

One participant voiced a concern that in an evacuation, it would be difficult to get her voice to carry beyond the installations to get the attention of the passengers remaining in the passenger cabin. However, crew believed the problem was improved on newer aircraft:

"...the new ones are better. They're more improved. I bet the [next new aircraft] will be like a dream to work on, you're going to see everything"

Mirrors

According to guidance material relating to direct view, using mirrors, transparent bulkheads and video cameras are all permitted to enhance the cabin crew members view of the cabin (FAA, 1994). In this study, only one aircraft was reported where transparent bulkheads were used, and no cabin crew members had ever used video cameras. However, use of mirrors was extensive, to allow cabin crew members to see passengers behind them. There were mixed reactions reported to the use of mirrors. While some found the mirrors to be a benefit, and reported them assisting in passenger supervision at takeoff and landing, there were concerns voiced by other participants.

A number of participants reported that the mirrors were not installed in locations where they were needed or were missing.

"But often the mirrors aren't there..."

"... You can't see anything going on. We really need mirrors"

However, most found the mirrors useful, provided that they were actually installed, were pointed in the right direction, and were clean. There are currently no checks carried out to ensure that the mirrors are cleaned and pointed in the right direction for seated crew. Perhaps if this were included in the pre-flight checks, the number and diversity of comments on mirrors would have been somewhat less.

There were also concerns raised about the size of the mirrors, because in some cases the mirrors were so far away that seeing any kind of detail was difficult.

"They don't show particularly a lot, they show very little, they don't show a lot. They show people standing up. You'd see someone standing up, you wouldn't see anything smaller"

"How do you cover a whole entire cabin?"

If a larger mirror gives the clarity and detail that allows cabin crew members to carry out their monitoring and supervisory role, airlines could consider replacing smaller mirrors with more effective ones. Airlines could review this issue, to ensure that the mirrors meet not only the regulatory requirements, but also meet the functional requirements of the cabin crew who use them.

Transparent bulkheads

While participants generally agreed that there would be a benefit in installing transparent bulkheads to enhance direct view, they also reported that this was really only the case in theory. The reality is that many of the bulkheads are parts of units and monuments such as lavatories, galleys and other stowage.

"...yeah, in theory. But in practice I don't know how that would work on some of the aircraft because obviously some of the bulkheads are parts of toilets or other things like storage places."

One of the airlines represented in the study uses a transparent bulkhead on one of their aircraft types. This decision initially created problems for the cabin crew working on the flight:

"With the transparent bulkheads, yeah that's a good idea as long as it doesn't divide different classes of cabin because we do have an aircraft, we do have a situation where there is a window going from [business] class to [first] class and you can see the passengers looking through to the [first] class cabin and its like a goldfish bowl"

To overcome these issues, a shutter was installed on the bulkheads. For takeoff and landing the shutter is pulled down, to allow the crew to see through to the next cabin. For the rest of the flight the shutters are up. This blocks the view and prevents light shining from one cabin to the next. Hence, in this situation a solution was found to enhance direct view at the critical phases of the flight.

Video cameras

All the participants in this study felt that video cameras and closed circuit television (CCTV) were an excessive means to enhance direct view.

"And just for takeoff and landing, because I know that's the most crucial part of the flight from a safety point of view, but once that's over with we're hardly ever in the galley, we're in the cabin, so to put up a piece of equipment that's there for just a few seconds at the beginning and end of a flight is an awful lot, an awful lot of money when I don't think that it would actually improve safety. I don't think it would make a difference to safety."

Not only would it be expensive to install, but cabin crew members reported an issue of reliability:

"I think you're better off with mirrors to be honest because equipment goes down, it goes wrong"

The participants did however report that video cameras could be of benefit in situations such as terrorism and disruptive passengers. However, some cabin crew members felt that this alone would not support the installation of such equipment.

Future innovations

Solutions and innovations to the issue of direct view, particularly for future aircraft types, were many and varied. Some of these suggestions were given in jest, and some in earnest. For example, in one interview a participant was asked what could be done to make the job easier, to which the reply was:

"No passengers!"

However, many of the serious solutions related to simply having more crew on board:

"The more help you have, the more hands, the better it is"

Another solution was to put more cabin crew in rearward facing seats. This would give the cabin crew member an unobstructed view of the passengers all the way to the aft of the cabin. Also suggested were sideward facing seats:

"We don't have any seats that are sideward facing. Sideward facing seats... you would be able to see the door opposite and also to see up the cabin."

This solution would seem to offer the best of both worlds: supervision of passengers and monitoring of the door. Research into sideward facing seats could be carried out, with respect to whether they are suitably crashworthy, whether they offer enhanced direct view of the cabin, where they should be installed, and the speed of retraction to ensure that no aisle is obstructed.

Conclusions

In summary, during the interviews, all participants reported that they never had a problem with direct view. However, they then proceeded to list the parts of the cabin and the situations in which they had limited or no view. Mirrors would appear to be the most feasible and cost effective way to enhance direct view. This would make it easier for cabin crew to monitor passengers during the critical phases of flight. However, mirrors are not always installed, and where they are, they are not always effective. Commonly reported problems in this study included mirrors that were too small, that were in the wrong places or not angled correctly, or not cleaned. However, this research was qualitative, and therefore gives little indication of the true extent of the problem because the results are not necessarily representative of crew flying with different operators on different aircraft types. Nevertheless, one simple solution would be to check, with crew members, that mirrors are provided where required, and that they are located in suitable positions. A requirement to check mirrors pre-flight could also be introduced.

Further, future very large transport aircraft and new generation aircraft types may include novel cabin interiors such as multiple cabins, multiple decks and internal staircases, and will carry larger numbers of passengers. Given these developments, it is perhaps even more important that cabin crew are able to monitor the actions and behaviour of passengers. Hence, the maintenance of direct view in flight operations on these aircraft types will need to be carefully considered at the design stage.

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