

Contribution of Medical Evidence in the Investigation of Kanishka Aircraft Accident

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Air India flight AI-182 from Montreal to London (Kanishka VT-EFO) had crashed over Atlantic on 23rd June 1985. Contribution of medical evidence in the investigation of this aircraft accident is discussed in this paper.

Keywords: Analysis of injury pattern, clothing status of recovered bodies, falling injuries, forensic examination.

On the 23rd of June 1985, Air India's Boeing 747 Kanishka aircraft VT-EFO was operating flight AI-182 from Montreal to London with 307 passengers and 22 crew members on board the aircraft. The aircraft took off from Montreal at 0218 and the flight continued uneventfully for about 5 hours. The aircraft transmitted all its position reports to the different ATC units. At 0713, when the aircraft was steadily cruising over Atlantic Ocean at 31,000 ft altitude about 100 miles South-West of the Irish Coast, the aircraft blip disappeared from the radar scope of Shannon airport. Repeated calls from Shannon ATC and a number of aircraft operating in that area did not receive any reply. Intensive search and rescue operations by sea and air were immediately launched, utilising a number of aircraft, helicopters and ships. About 2 hours later, a Panamian ship Laurentian Forest sighted the wreckage floating on water almost at the position where the aircraft was last observed in air on Shannon ATC Radar scope. Only 131 bodies and about 3 to 5 % of aircraft wreckage consisting mostly of non-structural parts and aircraft interior floating over water were recovered.

In accordance with the ICAO procedures, India was the investigating authority since the accident had occurred to an Indian registered aircraft over international waters. On 24th June

1985, an Indian investigating team reached Cork, the Irish sea port and aerodrome nearest to the site of accident. The team faced the most difficult task ever experienced by investigators of having to investigate a major disaster over international waters about 5,000 miles away from the country of registry and the place of investigating authority, without the availability of any crew members, passengers, eye-witnesses and the wreckage. The wreckage along with the 'Black Boxes' was lying 6,700 ft. under water in Atlantic Ocean, 100 miles off Irish Coast. The aircraft had plunged so suddenly into the Atlantic Ocean that the flight crew could not even transmit any emergency message and hence the ATC tapes also did not contain any information about the accident. There was no clue whatsoever available in the beginning as to what caused a smoothly cruising aircraft to plunge into the sea all of a sudden.

Faced with a situation of having practically no material evidence available, the investigation team realised that maximum possible information should be derived from the bodies of the victims.

Out of the 329 persons on board the aircraft, initially 131 bodies were recovered. One body was subsequently recovered during the course of wreckage recovery. The bodies were taken to the Cork Regional Hospital, Cork, in Ireland for detailed examination. All the bodies could be identified and there was no body of any flight crew member. Post mortem examination was carried out on all the bodies.

In order to derive maximum possible evidence for the purpose of investigation, a 'Medical and Human Factors Group' was constituted with specialists from Ireland, UK, Canada and India. The group carried out in-depth

study of the records of the pathologists who conducted the post mortem examinations and also held detailed discussion with them to come to some useful conclusions.

The breakdown of the number of bodies recovered in terms of adult males, adult females, crew and children is given in Table I.

Table - I Details of recovery of bodies

	Occupants on board	Number bodies recovered	Percentage of recovery	Percentage of total bodies recovered
Adult Male	95	14	14.7	10.7
Adult Female	136	79	58.0	60.3
Crew	22	5	22.7	3.8
Children	76	33	43.4	25.2
Total	329	131	39.8	100.0

The above data indicate that the major proportion of the bodies which had floated and later recovered were of females and children. The children showed less overall injury compared to the adults. This is perhaps because children are said to be more tolerant to impact forces due to greater elasticity of their skeleton. Also, it is said that unlike adults, they do not tense and so they are likely to be less severely injured in comparable situations.

One of the reasons for the non-recovery of a large number of victims was that they were trapped within the wreckage. Many of the bodies recovered had shark bites. Further, video recording of the wreckage showed parts and/or whole bodies which had been the subject of attack by predators. Some of the bodies, even if dismembered, may have been devoured by predators. The female to male body floating ratio was 104:27 which is close to the expected ratio of 4:1.

The seating distribution of the passengers and the bodies recovered, based upon the seats assigned to them, is given in Table II and it can be seen that all of the recovered victims were seated in economy class/zone and that the recovery rate increased towards the rear.

Consequently any conclusion about the injuries and the events which may have caused them, refers only to that part of the aircraft.

Table - II Seating Distribution of the recovered bodies

Zone/Class	Seats Available	Seats Occupied	Bodies Recovered	Percentage of number in zone
PASSENGERS:				
Zone 'A'				
First Class	16	1	0	0
Zone 'B'				
Club Class	22	0	0	—
Upper deck	18	7	0	0
Zone 'C'				
Economy Class	112	104+2	29	27.9
Zone 'D'				
Economy Class	86	84+1	40	47.6
Zone 'E'				
Economy Class	123	106+3	57	54.3
Total Passengers	377	301+6	126	41.9
CREW:				
Flight Crew	3	3	0	0
Cabin Crew	19	19	5	26.3
Total Crew	22	22	5	22.7
Grand Total	399	329	131	39.80

The injuries noted at autopsy, were scored in an ascending order of severity. The scale used was from 0-4, nought having no injury and 4, fatal injury. Though there is some subjectivity in the assessment, the results emerged from this analysis is given in Table III.

Table - III Analysis of gravity of injury in bodies recovered

Gravity of injury	Number of victims	Percentage of total number of bodies recovered
Mild	45	34.4
Moderate	51	38.9
Severe	33	25.2
Catastrophic	2	1.5
Total	131	100.0

This shows that nearly 75% of the victims were only moderately injured. It can thus be assumed that the accident forces to which they were subjected were moderately severe. There are two possible explanations for this - either they were cushioned from the effects of the impact forces whilst within the aeroplane or as discussed in the following paragraphs they were not present in the cabin when it impacted the water.

A further break up showing the zone-wise overall injury pattern of the recovered victims is given in Table IV which indicates that the overall severity of injury increases towards the rear of the aeroplane, i.e. from zone 'C' to 'E' and is significantly less in zone 'C' than in zones 'D' and 'E'. Judged in terms of the overall severity of injuries, the accident was non-survivable.

Table - IV Break up of zone-wise overall injury pattern of victims

Zone	Injury									Total No (%)	
	No	Minor (%)	% of total	No	Moderate (%)	% of total	No	Severe (%)	% of total		
C	8	(17.8)	6.1	9	(17.7)	6.9	4	(11.4)	3.1	21	(16.0)
D	9	(20.0)	6.9	15	(29.4)	11.5	9	(25.7)	6.9	33	(25.2)
E	15	(33.3)	11.5	15	(29.4)	11.5	14	(40.0)	10.7	44	(33.6)
?	13	(28.9)	9.9	12	(23.5)	9.2	8	(22.9)	6.1	33	(25.2)
Total	45	(100.0)	34.4	51	(100.0)	39.1	35	(100.0)	26.8	131	(100.0)

As mentioned earlier, all the victims recovered were from the economy class zones of the aeroplane where the seat pitch is 34". This means that majority of people will make contact with the back of the seat in front even if they have the seat belt fastened. This is confirmed from the fact that many of the victims showed the typical fore-aft facial flattening, which this type of contact produces. It is important to note that no unequivocal signs of lap belt wearing were found in any of the victims. Only four bodies showed some evidence of seat belt wearing. Although passenger compliance with safety warnings is not very high, it is unlikely that only 3.1% of the recovered victims would have responded to the warning, if given. If the victims were not wearing their seat belts, then it is likely that they were not forewarned of any impending disaster. It is the

practice of Air India, as it is in other responsible airlines, to request the passengers to return to their seats and put on their seat belts, if there is any anticipated hazard. Consequently, we must assume that the accident was unanticipated and that there was no time for people to take these safety measures. It would also seem likely that the crew were unable to warn the passengers, or if they were, then there was no time for them to fasten the seat belt, and so the event must have occurred suddenly.

Clothing of the victims gives quite useful information about the events during an accident. Loss of clothing of victims in an accident is associated with violent ejection from an aeroplane and it is reasonable to assume that those still

wearing it could have been retained within the wreckage, at least for a time, and then released more gently. Clothings of the victims recovered were classified in four categories. Those regarded as being moderately clad had at least one item of outer clothing, whilst those classified as having very little clothing had only undergarments on. The distribution of victims, zone-wise and degree of their clothing is given in Table V.

It can be seen that the distribution of the various categories was, fully clad 29 (22.2%), moderately clad 38 (29%), very little clothing 43 (32.8%) and nude 21 (16%). The fully clad victims were mostly seated at the front right of the aeroplane and they had lower severity of injury than the remainder. The moderately clothed

Table - V Zone-wise distribution of victims and their clothing status

Status of clothing	Number of Passengers in Zone						Crew	Total	
	C		D		E			No	%
	No	%	No	%	No	%			
Full	15	51.7	6	15.0	8	14.0	—	29	22.2
Moderate	6	20.7	12	30.0	18	31.6	2	38	29.0
Very little	5	17.2	17	42.5	18	31.6	3	43	32.8
Nude	3	10.3	5	12.5	13	22.8	—	21	16.0
Total	29	100.0	40	100.0	57	100.0	5	131	100.0

victims did not show any significant difference between them and the whole population. Major proportion of the victims having very little clothing were seated towards the rear of the aeroplane and there was no significant difference in the severity of their injuries. The nude victims were mostly seated in the rear right side of the aeroplane and they were the most severely injured of all.

The biological samples taken from the crash victims were sent to the Forensic Science Laboratory, Dublin. The blood samples were examined for the presence of carboxyhaemoglobin. The carboxyhaemoglobin level of the samples were all less than six percent. Cyanide analysis indicated that 105 blood samples contained less than 2 µgm of cyanide per 100 ml and nine specimen contained between 2 and 4 µgm of cyanide per 100 ml. Normal blood contains upto 15 µgm of cyanide per 100 ml.

The above test results did not reveal the presence of any significant quantities of carbon monoxide or cyanide indicating that these poisonous substances were not involved in the deaths. If a fire had been burning while the passengers were alive, then carbon monoxide and possibly cyanide would be found in the blood. The tests results, therefore, rules out the possibility of a fire in the aircraft for any length of time prior to crash.

The forensic examination of the bodies did not disclose any evidence of an explosion. It is

likely that the bodies may not show any signs of explosion if it had occurred in the forward cargo hold, as zone 'B' which is directly above the forward cargo compartment was supposed to have been unoccupied as per the allotted seating plan.

There were 26 bodies that showed signs of hypoxia, 9 in zone 'C', 6 in zone 'D' and 11 in Zone 'E'. There were 25 bodies showing signs of decompression, which were evenly distributed throughout the zones, but at the sides, particularly the right side.

Flail pattern injuries were exhibited by nine bodies. Five of these were in Zone 'E' one in Zone 'D', two in Zone 'C' and one cabin crew member. Flailing is an uncontrolled rotary overment of the limbs and may occur when an individuals thrown out of an aeroplane at altitude when the injuries are caused by windblast. This indicates that the aircraft had broken in mid-air at an altitude and that the victims had come out of the aircraft at altitude before it hit the water. The pattern of injuries also suggested that there were at least two phases of injuries, one in the air and the other at water impact.

To sum up, the medical evidence contributed very useful information to arrive at the cause of the accident. This was particularly important in this accident as very little material evidence was available for the purpose of investigation. The medical evidence clearly indicated that the event which took place aboard

flight AI-182 was unanticipated and that the aircraft was subjected to severe forces at altitude, which caused it to break up whilst still in the air with an explosive decompression. Though no direct medical evidence was available to pin-point the cause of accident, it supported the theory of break up of the aeroplane in mid-air due to explosion of an explosive device.

It was finally confirmed from the evidence drawn from the recordings of flight recorders, the laboratory examination of the wreckage recovered and the examination of the video films and still photographs of the wreckage lying on sea-bed, that the accident occurred due to explosion in the forward cargo compartment. This was indeed the worst disaster in the history of Indian civil aviation.