NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF HIGHWAY SAFETY
WASHINGTON, DC 20594

July 10, 2008

Survival Factors Specialist's Factual Report

## 1. ACCIDENT

**Accident:** **CHI06FA210**
**Location:** **Sullivan, MO**
**Vehicle #1:** **Dehavilland DH-6, N203E**
**Date:** **July 29, 2006**
**Time:** **Approximately 1349 CDT**

## 2. GROUP MEMBERS

None was formed

## 3. ACCIDENT SUMMARY

On July 29, 2006, about 1345 central daylight time, a de Havilland DHC-6-100, N203E, registered to Adventure Aviation, LLC, and operated by Skydive Quantum Leap as a local parachute jump flight, crashed into trees and terrain shortly after takeoff from Sullivan Regional Airport (UUV), near Sullivan, Missouri. The pilot and five parachutists sustained fatal injuries, and two parachutists sustained serious injuries. The flight was operated under 14 *Code of Federal Regulations* (CFR) Part 91 with no flight plan filed. Visual meteorological conditions prevailed.

## 4. FACTUAL

### *4.1. Video Observations*

On March 25, 2008, the Crashworthiness Specialists reviewed 2 videos that were shot by helmet cameras worn by two male skydivers. Three female and four male

occupants were observed boarding the plane and in the cabin and a pilot was observed in the left seat of the cockpit. Descriptions of each occupant follow.

FEMALE 1: Female 1 wore a yellow jumpsuit, black shoes, but was not wearing a parachute. She was wearing a tandem passenger harness.[1] She had brown hair in a ponytail. She was aft-facing and straddling the square cushion on aircraft right aft of Male 1. She was in close proximity to Male 1.

FEMALE 2: Female 2 wore a purple jumpsuit, white shoes, but was not wearing a parachute. She was wearing a tandem passenger harness. She had blond hair in a ponytail. She was aft-facing and straddling the square cushion on aircraft left aft of Male 2. She was in close proximity to Male 2.

FEMALE 3: Female 3 wore a teal-green jumpsuit, a black helmet[2] and had long brown hair. She was wearing a parachute. She was located on the floor in a semi-reclined position on aircraft right just aft of the square cushion with her parachute leaning against the square cushion. She appeared to have a gray wall-mounted restraint system loosely attached around her harness at the left thigh. The sidewall attach point appeared to be under window 5. (Passenger windows were numbered 1-7, for reference purposes only, from front to back on the right side as shown in Figure 17 below.)

MALE 1: Male 1 wore a white t-shirt and blue pants with black material over the knee area. He wore a parachute[3] and had short brown hair. He was the most forward occupant aft-facing and straddling the square cushion on aircraft right. He was seated just forward of Female 1.

MALE 2: Male 2 wore a blue jumpsuit with red and white elliptical stripes on the legs and arms. He wore a parachute[3] and his hair was dark and worn in a "crew cut". He was aft-facing, straddling the seat cushion on aircraft left, forward of Female 2 and appeared very close to Female 2.

MALE 3: Male 3 wore a white jumpsuit, a parachute and a helmet. Two cameras were mounted on the helmet and an eyepiece was over his right eye. A still camera was mounted on the top of the helmet and a video camera was mounted on the left side of the helmet. Male 3 had short dark hair. This passenger was initially looking out the left cargo door. After engine noises were heard, he returned inside the cabin and sat aft-facing on the floor on aircraft left. He appeared to be leaning backward against his parachute in a semi-reclined position. His head was directly adjacent to the second window forward of the left cargo door (window 5 in Figure 17).

Male 4: Male 4 wore a dark blue and black jumpsuit, a parachute and a helmet. Two cameras were mounted on the helmet and an eyepiece was over his left eye. A still

[1] The tandem passenger harnesses were produced by Uninsured United Parachute Technologies, LLC 1645 Lexington Avenue DeLand, FL 32724-2106 USA.
[2] Additional descriptions of the helmets can be found in Section 4.1.2.
[3] This appeared to be a tandem parachute system.

camera was mounted on the top of the helmet and a video camera was mounted on the left side of the helmet. He wore glasses and was wearing a light gray tee shirt. This passenger was initially leaning toward the left cargo door. After engines noises were heard, he returned inside the cabin near the right aft corner of the aircraft. He was facing forward. A short time later, he rotated, sat and appeared to face aft on the right side of the aircraft.

### 4.1.1. Passenger Seats and Restraints

The cabin had no traditional aircraft seats or benches. The parachutists' restraints were mounted along the sidewall and can be seen in Figure 1. Two cushions were present along both the left and right sides of the aircraft and extended from the bulkhead rearward to approximately the end of window 3, as also shown in Figure 1 below.

Using the helmet camera videos, ten restraints were observed attached to the left sidewall and eight were observed on the right sidewall. The restraints are numbered from front to back and are also shown in the diagram in Figure 17. Table 1 lists the observed colors of the restraint webbing.

**Figure 1: Pre-accident photographs showing the interior on both aircraft left and right.**

The webbing restraints in the accident airplane were equipped with hook-type latches that connected to the cargo rings that were subsequently attached to the side-wall seating tracks installed on the left and right cabin sidewalls. The type of attachment to the sidewall varied along the length of the airplane; the hook-type latches on some restraints were observed to be connected to one cargo ring, whereas others were observed to be connected to two cargo rings.

**Table 1: Observed colors of the restraint webbing along aircraft left and right.**

| Restraint # | Webbing Color | |
|---|---|---|
| | Aircraft Left | Aircraft Right |
| 1 | Black | - |
| 2 | Grey | - |
| 3 | Black | Black |
| 4 | Grey | Grey |
| 5 | Black | Black |
| 6 | Grey | Grey |
| 7 | Black | Black |
| 8 | Black | Black |
| 9 | Grey | Grey |
| 10 | Grey | Grey |

### 4.1.2. Helmets

Three parachutists (Female 3, Male 3, and Male 4) were wearing open face helmets at the time of the crash. Examination of the camera videos and the post-accident photographs enabled identification of the helmets. Male 3 wore a Bonehead Composites Optik[4] teal helmet with two cameras mounted on the helmet. An exemplar photograph of the Bonehead Composites Optik helmet is shown in Figure 2. The weight of this helmet is 27 oz. Extensive damage to the Bonehead Composites Optik helmet was noted on post-accident photographs. The weight of the helmet with both cameras is unknown. Male 4 wore a Bonehead Composites Optik Illusion[5] black helmet with two cameras mounted, as well. An exemplar photograph of the Optik Illusion is shown in Figure 3. The Optik Illusion weighs 26.4 oz. and again, the weight with cameras mounted is unknown. The helmet was found in the aircraft wreckage, as shown in Figure 4. Description of all the Bonehead helmets can be found on the Bonehead Composites website. For example, the description accompanying the Guner helmet, one of the new Bonehead helmets not designed for camera mounting, is as follows:

> *One of the first things you'll notice about the GUNER when you first put it on is how quiet it is. The next thing you'll notice is the smooth curves and smooth styling of the helmet shell finished off with a Fastex buckled chin strap and leather covered chin strap. We listened to our customers and developed the GUNER to meet all of your expectations. You wanted semi-flexible, smooth curves, quiet and enough room to put*

[4] http://www.boneheadcomposites.com/optik.htm on May 29, 2008.
[5] http://www.boneheadcomposites.com/optikillusion.htm on May 29, 2008.

*at least 2 audibles on the inside of the helmet.... AND YOU GOT IT with our new GUNER helmet!*

Female 3 was wearing a helmet that was reported[6] to be a classic ProTec[7] helmet. The ProTec website lists helmets for use in a variety of activities including skate, bike, snow and water but not Air (or skydiving). The Classic Full Cut helmet, which appears most consistent with the shape and coverage of the helmet worn by Female 3, meets various specifications depending on the application including CE EN 1385 Water Sport Safety Standard for the water helmet and ASTM 2040 or CE EN 1077 for the snow helmet. Other websites[8] offer a Classic Full Cut Air ProTec model but that model is not listed on the ProTec website. A picture of an exemplar ProTec Air helmet is shown in Figure 5.

Skydiving helmets are not required to meet any federal standards. Voluntary standards addressing helmet design and function, such as those developed by ASTM International, Snell, or the National Operating Committee on Standards for Athletic Equipment (NOCSAE), that apply to skydiving activities do not currently exist, despite the existence of helmet standards for activities such as horseback riding, rock climbing, skiing, sledding, and roller skating, to name a few.

**Figure 2: A photograph of the Bonehead Composites Optik helmet commonly used for mounting cameras.**

[6] Interview with Jim Cowen on June 10, 2008 in Attachment 1.
[7] http://www.pro-tec.net/ on June 16, 2008.
[8] http://www.baddogservices.com/catalog/product_info.php?products_id=690 and http://www.protechelmet.com/products.asp?cat=14&pg=2


**Figure 3: A photograph of the Bonehead Composites Optik Illusion helmet commonly used for mounting cameras.**

**Figure 4: A post-accident photograph showing the Bonehead Composite Optik Illusion helmet.**

**Figure 5: A photograph of Classic Full Cut Air Skydiving helmet.**[9]

### *4.2. Interior Configuration*

The airplane was originally certificated with passenger seats that were equipped with lap belts. A typical seating arrangement can be seen in Figure 6. To accommodate parachuting operations, the FAA must approve of any changes to the interior configuration.[10] For example, FAA Regulations 14 CFR.91.107(a)(3)(ii) allows occupants to: "Use the floor of the aircraft as a seat, provided that the person is on board for the purpose of engaging in sport parachuting."

On April 17, 2000, the FAA, Greensboro FSDO-05 approved a FAA Form 337 "Major Repair and Alteration" that allowed all cabin seats to be removed to utilize the aircraft for skydiving and "Installed twenty two troop seats to accommodate skydivers for takeoff and climb to altitude." "Twenty two sets of seat belts were installed on the seat tracks by means of at least 4000 pound rated cargo tie down rings. With the troop seats installed and or just the seat belts installed, this gives the aircraft 24 stations which includes the co-pilot's seat as possible stations for skydivers." On October 5, 2000, another FAA Form 337 approved work that "Installed straddle bench seats." (See Attachment 2 for Form 337.) Photographs of two types of straddle bench seats are shown

[9] http://www.protechelmet.com/products.asp?cat=14&pg=2 on June 16, 2008.

[10] Advisory Circular AC No. 105-2C, Sport Parachute Jumping, dated 1/2/91, provides "suggestions to improve sport parachuting safety and disseminates information to assist all parties associated with sport parachuting in complying with Federal Aviation Regulations (FAR) Part 105, Parachute Jumping." AC 105-2C, Part 23, Aircraft Operating and Airworthiness Requirements includes information on the Installation and removal of equipment. The guidance states, "The installation or removal of equipment in an aircraft or the increase in passenger loads, other than that already approved for that aircraft, requires some form of FAA approval such as a type certificate data sheet, supplemental type certificate data sheet, or FAA field approval, if applicable. Anyone applying for approval to alter an aircraft for parachute jumping operations should submit sufficient evidence to the local FSDO to permit evaluation of the following:" (Door removal, the relationship of maximum number of persons to safety belt requirements and weight and balance, and parachute jump exit procedures)

in Figure 7. The twenty-three[11] standard seating stations for jumpers, developed for this aircraft, are shown in Figure 8.

Although there is documentation that these straddle bench seats were installed in the accident aircraft and were approved by the FAA, evidence from the helmet camera videos and from the accident scene show that the aircraft was actually equipped with two foam cushions used as seating for the parachutists. These foam cushions, shown in Figure 1, were not attached to the aircraft. The approximate dimensions of the cushions were a 15"-18" square with a 5 – 6 foot length. A post-accident photograph showing the damage to the foam cushions can be seen in Figure 9.

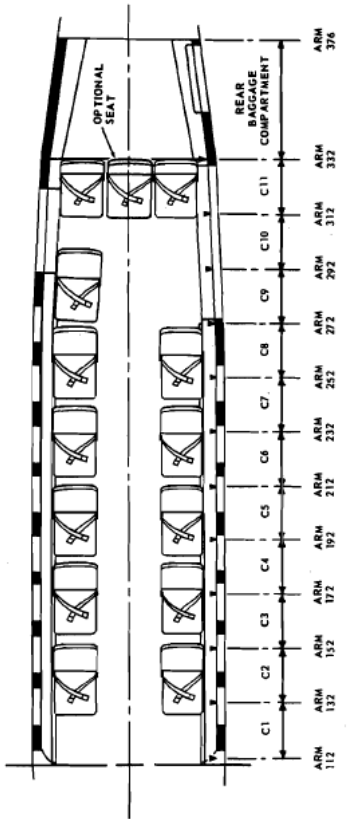


**Figure 6: A typical seating arrangement for this aircraft.[12]**

[11] The co-pilot's seat is the 24th station.
[12] From Airplane Flight Manual.

**Figure 7: Straddle bench seats commonly installed in aircraft to accommodate parachuting operations.[13]**

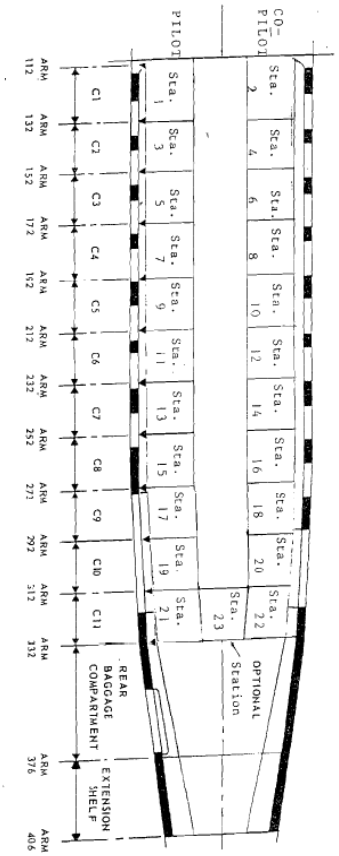


**Figure 8: Jumper station assignments.[14]**

[13] Photographs received from Paul Fayard, Fayard Enterprises, LLC on April 29, 2008.
[14] From Airplane Flight Manual.

**Figure 9: A post-accident photograph showing the foam cushions used for parachutist seating in the accident aircraft.**

### *4.3. Damage*

#### 4.3.1. Aircraft Damage

**Figure 10: A photograph showing aircraft right before the right wing was removed. Wrinkling and cracking of the plane body can be seen as high as the right cabin door frame.[15]**

[15] Photograph from the Franklin County Medical Examiner.

**Figure 11: A photograph showing aircraft right after the right wing was removed. Crush damage can be seen immediately forward of the second window in the passenger compartment.**

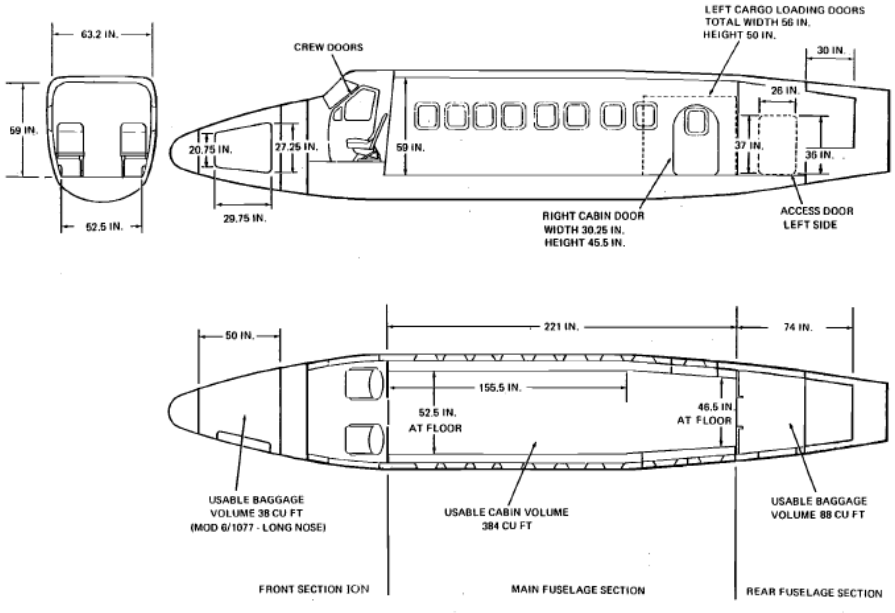


**Figure 12: A diagram of the cabin and baggage compartment dimensions.[16] Note that the third window in the passenger compartment aft of the pilot station was not on the accident aircraft.**

Figure 10 and Figure 11 show the accident aircraft at rest. Crush damage can be seen immediately forward of the second window in the passenger compartment. Additional damage can be seen extending rearward to the right cabin door frame.

[16] From Aircraft Flight Manual.

Approximate dimensions of the aircraft and the region of crush were scaled from the diagram in Figure 12. Since this is a long nosed version of this aircraft, that crush line would correspond to approximately 172 inches of crush. But, the nose region of the aircraft is not structural.[17] The nose is constructed from balsa wood and fiberglass. Thus, the region forward of station 60 (the approximate location where the nose wheel attaches) can not be considered structural and will not add measurable resistance to crush. As a result, the length of crush is approximately 172 inches – 81 inches = 91 inches long (7'7").

### 4.3.2. Restraint Damage

Examination of the helmet camera videos, the pre-accident photographs and the post-accident photographs showed various methods for attaching the restraints to the sidewall. All restraints visible in these media incorporated two sections: the webbing attached to the tongue and the webbing attached to the buckle. Some restraints were attached to the sidewall at a single point by means of a single ring. Other restraints were attached to the sidewall at two adjacent points with a single ring for each half of the restraint. Still others were attached at the sidewall via a triangular shaped metal bracket (restraints 9 and 10 on aircraft right). Table 2 lists the attachment type for all visible points.

**Table 2: Restraint attachment type based on restraint location.**

| Restraint # | Attachment Type | |
|---|---|---|
| | Aircraft Left | Aircraft Right |
| 1 | Unknown | Unknown |
| 2 | 2 Rings | 2 Rings |
| 3 | 2 Rings | Unknown |
| 4 | Unknown | Unknown |
| 5 | 2 Rings | 2 Rings |
| 6 | 1 Ring | 1 Ring |
| 7 | 1 Ring | 1 Ring |
| 8 | 1 Ring | 1 Ring |
| 9 | 1 Ring | Bracket |
| 10 | 1 Ring | Bracket |

Window locations and approximate seat attachment points are shown and labeled in Figure 13. Based on these window locations and attachment points, the location of the post-accident restraint photographs can be identified. The post-accident photographs of the restraints along aircraft left are shown in Figure 14 and those from aircraft right are shown in Figure 15.

[17] Personal conversations with Mike Moore at Viking on 3/18/08.

The intrusion along aircraft left appeared to extend to just in front of restraint 1 with the track broken at that location. Aft of the break, the track seems to be in good condition. All attachment points were present and photographed post-accident. Damage was noted to restraint 4. The pre-accident photographs appear to show two hooks attached to the single attachment point for restraint 4 but post-accident photographs only show the single attachment hook. The latch and buckle from restraint 4 were photographed in the connected position, post-accident. The end of the webbing not attached to the track appeared to be cut. The attachment ring was deformed. This deformation to the ring and the cut end of the webbing can be seen in the inset photo for restraint 4 in Figure 14.

Much damage was seen at the front of the aircraft and in the region of the forward most restraints along aircraft right. There is uncertainty about the position of the restraint labeled 1 in Figure 15. That restraint was photographed outside of the accident aircraft. The restraint best matched location 1 on aircraft right based on damage to the aircraft, evaluation of the other restraint positions, webbing colors along aircraft left and restraint types along aircraft left. Uncertainty also existed for the attachment point labeled restraint 2 in Figure 15. These two attachment rings were determined to be part of restraint 2 based on the surrounding damage, the orientation of the green sidewall liner, the appearance of an open hatch in the upper right quadrant of the photograph, rectangular cut-outs in the green sidewall liner similar to those below the hatch in the pre-accident photographs and the damage seen on the left in the photograph showing restraints 3 and 5 (Figure 15). The restraint webbing was missing from the attachment points for restraint 2. Because of the limited photographs pre-accident, it is unknown if webbing was present for this restraint position before the accident. Photographs of the attachment points for restraint 3 were not available but the latch for belt 3 was deformed so that it would not close normally. Based on the pre-accident photographs, restraint 4 appears to be approximately 20 or 21 attachment points[18] forward of the restraint with the black webbing believed to be restraint 5. (Restraint 5 has a label above it stating ‘C5’. This label likely corresponds to the moment arm C5 in the jumper station assignment diagram shown in Figure 16.) Counting forward of restraint 5 in the accident photographs shows that there is a break in the track approximately 20 attachment points forward of restraint 5, which is the likely location for restraint 4 (grey webbing identified in the videos). No post-accidents photographs were available showing restraint 4 or its attachment points. In addition, half of the webbing is missing from restraint 5. (There should be a second restraint attached to the forward ring at restraint position 5.) Also, the aft attachment pin from restraint 5 appears to be slightly pulled out from the track. No post-accident photographs were available for restraint 6. The webbing of restraint 9 appears to be folded below the stitching. Folding may indicate loading to webbing.

[18] Attachment points, in this case, refers to the small circular notches in the track used either to attach the seats or, in this case, to attach the jumper restraints. These circular notches can be counted to identify positions along the track.

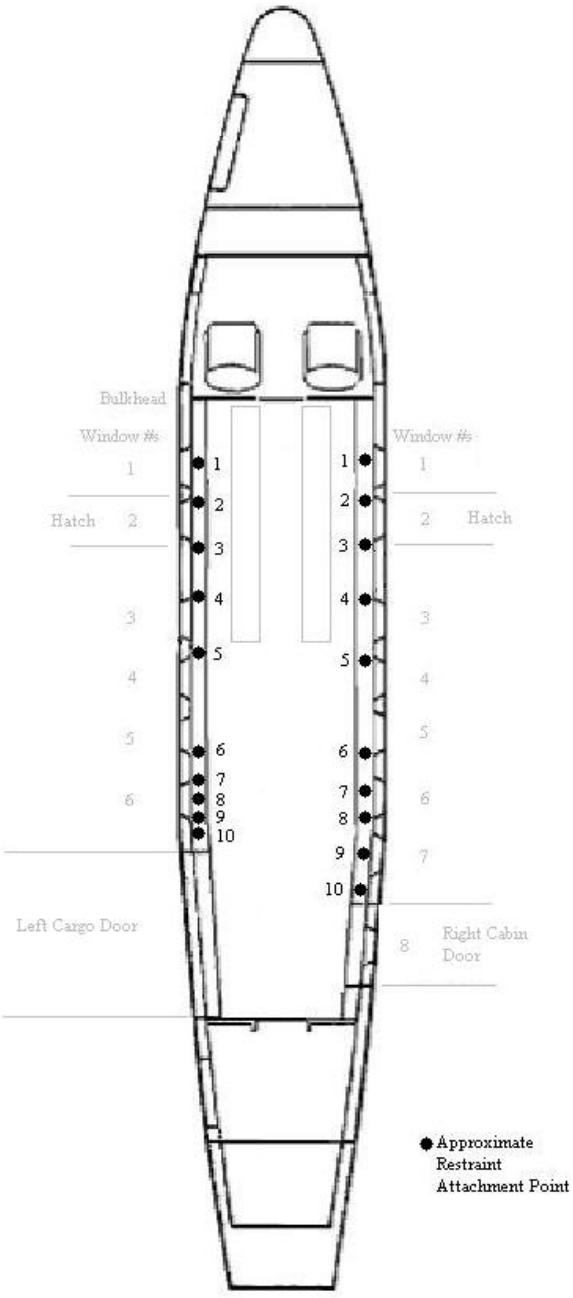


**Figure 13: An aircraft diagram showing the window locations and the approximate locations of the restraint attachment points.**


**Figure 14: Post-accident photographs showing the restraints along aircraft left from back to front. The restraints are labeled as shown in Figure 13.**


**Figure 15: Post-accident photographs showing the restraints along aircraft right from front to back. The restraints are labeled as shown in Figure 13.**

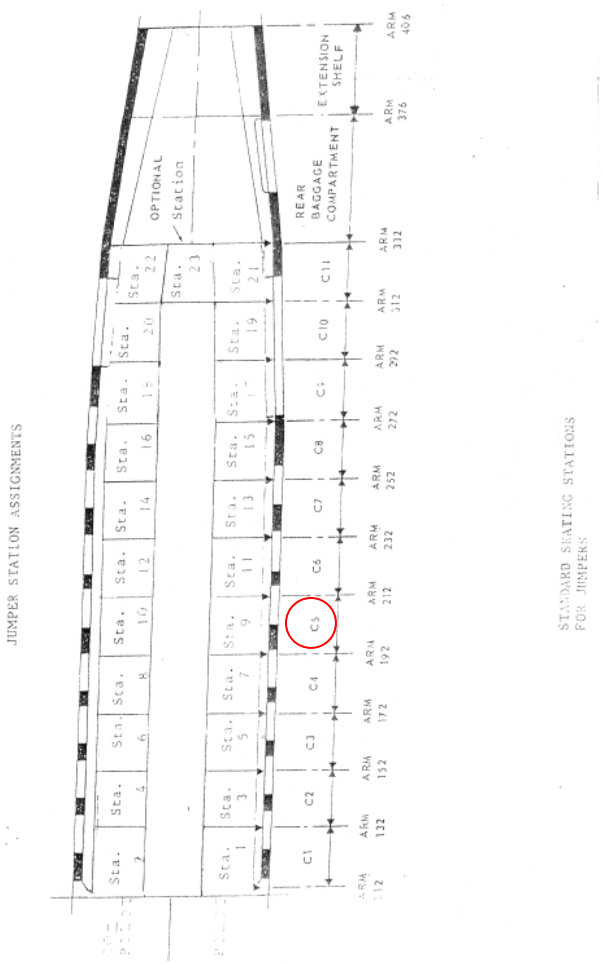


**Figure 16: Jumper station assignments. Note the label C5 in reference to the moment arms along the length of the aircraft.**

### *4.4. Passengers*

Each passenger signed an "Agreement, Release of Liability and Assumption of Risk Contract" with the parachuting operator that provided self-reports of height and weight. Table 3 summarizes the self-reported height and weight for each passenger.

**Table 3: Self-reported height and weight for each passenger.**

| Passenger | Height | Weight (lbs) |
|---|---|---|
| Female 1 | 5’3” | 115 |
| Female 2 | 5’5” | 125[19] |
| Female 3 | 5’3” | 180 |
| Male 1 | 5’10” | 155 |
| Male 2 | 6’0” | 250 |
| Male 3 | 5’8” | 180 |
| Male 4 | 5’10” | 195 |

### 4.4.1. Seating Diagram

A seating diagram was developed based on the observations from the two helmet camera videos. Gender, age and injury level (presented in section 4.6 of this report) are included on the seating diagram for clarity. In addition, the approximate crush line for the aircraft was labeled based on photographs taken on-scene. Approximate restraint attachment points are also labeled. Passengers wearing a helmet or a helmet camera were also labeled. Windows were numbered for reference. The aft cargo and cabin door and the window hatch locations were also labeled on the diagram.

[19] This weight was marked as kilograms on the contract but is believed to be pounds.

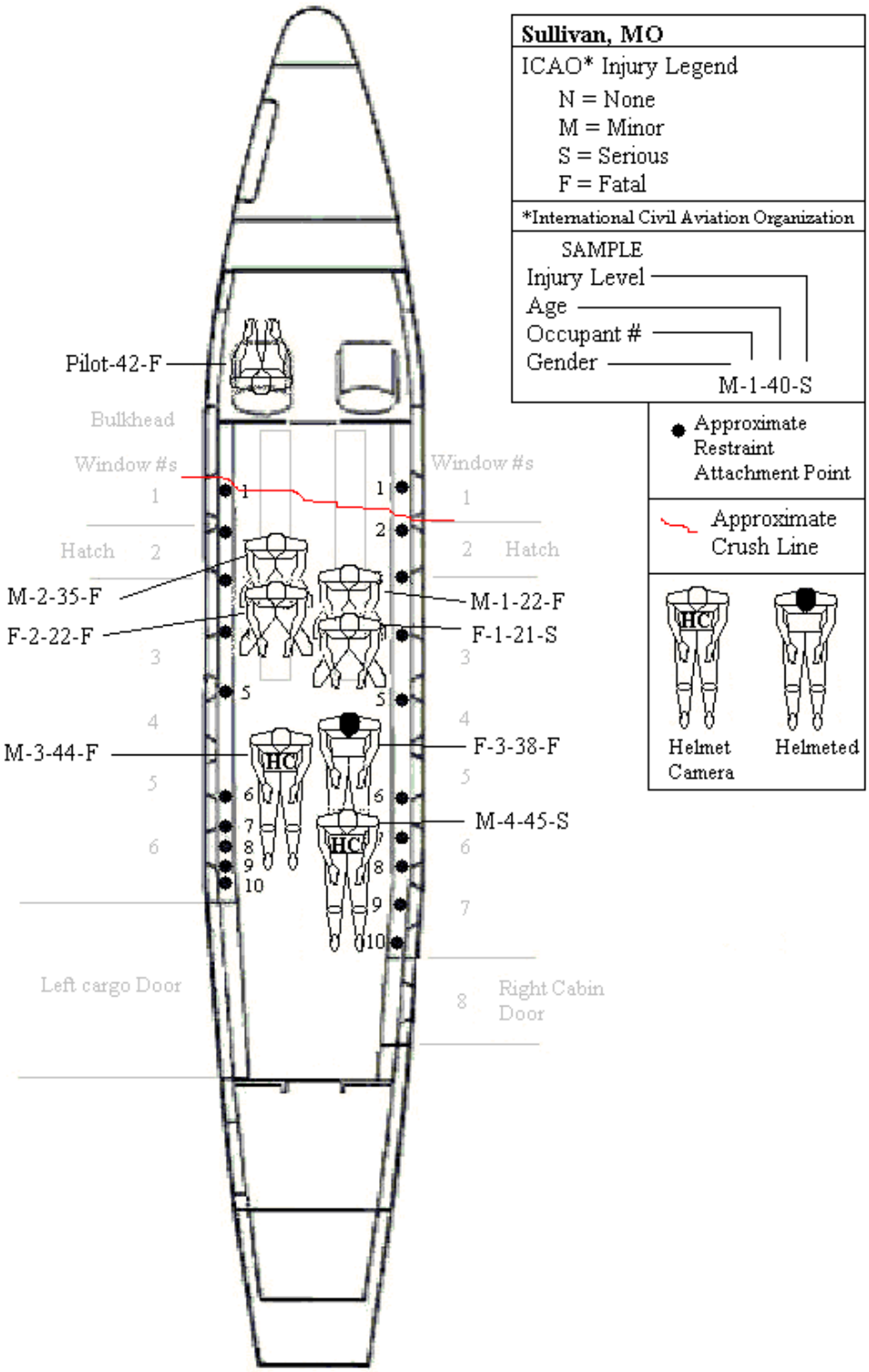


**Figure 17: A diagram showing the seating positions and orientations based on observations from the video cameras.**

### *4.5. Seating Policy*

According to the brother of the owner of the parachuting operation involved in this accident, (see Attachment 1) all parachutists are restrained to the aircraft before the aircraft moves. Helmets must either be worn or if not worn, must be restrained. The restraint to the aircraft is either passed through the vertical (main lift) webbing or the leg webbing. There is no specific instruction for where parachutists sit in the aircraft. Generally, they sit in a format so that the first parachutists into the plane are the last to jump from the plane. Tandem parachutists jump from the highest altitudes (to better handle emergencies and because tandem parachutes open more slowly) and therefore, sit in the front of the aircraft. The straddle cushions facilitate tandem parachutists fastening their harnesses together because parachutists are in a seated, upright position, rather than seated on the aircraft floor. Tandem students stay restrained to the aircraft until they harness to the instructor, which usually occurs 2-5 minutes prior to exiting the aircraft. Tandem jumpers never harness together on the ground. Also, the licensed jumpers stay restrained to the aircraft until 1000 feet off the ground but tandem instructors stay restrained until 2000 feet off the ground. There is no specific instruction provided to parachutists on which restraint to use or on how tightly to fasten the restraint.

### *4.6. Injuries*

Table 4 summarizes the injuries sustained for the pilot and each passenger based on medical records, where available, and autopsy reports. Descriptions of the injuries sustained along with age, height and weight are shown in Table 5. Height and weight were based on self-reported information shown in Table 3 above. For simplicity in the table, the passenger labels were reduced from, for example, ‘Female 1’ to ‘F-1’.

**Table 4: A summary of the injuries sustained by the flight crew and the passengers.**

| | **Pilot** | **Passengers** | **Others** | **Total** |
|---|---|---|---|---|
| Fatal | 1 | 5 | 0 | 6 |
| Serious | 0 | 2 | 0 | 2 |
| Minor | 0 | 0 | 0 | 0 |
| None | 0 | 0 | 0 | 0 |
| Total | 1 | 7 | 0 | 8 |

**Table 5**: A table of the occupant injury description and classification.[20]

| Occupant Location | Gender | Age | Height | Weight | Description Of Injuries | Injury |
|---|---|---|---|---|---|---|
| Pilot | Male | 42 | 70” | 170 lbs | Left frontal, right temporal and occipital subgaleal hemorrhages, atlanto-occipital fracture, mandible fracture, acute subdural hemorrhage, subarachnoid hemorrhage, sternum fracture, fractures of all ribs anterior and laterally, 2 heart lacerations, 2 aortic lacerations, lung contusions and lacerations, bilateral hemothoraces, liver and spleen laceration, pelvic fracture, right shoulder fracture, right ulna and radius compound fracture at wrist, left ulna and radius compound fracture midshaft, left tibia and fibula compound fracture, left foot maceration, right femur compound fracture, right tibia and fibula compound comminuted fracture, avulsion right and left thigh and leg, multiple abrasions, contusions and lacerations to the head, face, neck, chest, and extremities | Fatal |
| M-1 | Male[21] | 22 | 70” | 155 lbs | C3 fracture, right anterior fossa fracture, left zygoma fracture, maxilla fracture, multiple bilateral rib fractures, left hemothorax, left ulna and radius fracture, multiple abrasions to the face, chest and extremities | Fatal |
| F-1 | Female | 21 | 63” | 115 lbs | C5 fracture, bilateral lung contusions, bilateral sacral fractures, Left L2, L3, L4 and L5 transverse process fractures, distal right clavicle fracture, lateral patella subluxation, multiple abrasions | Serious |
| M-2 | Male | 35 | 72” | 250 lbs | Left orbital ecchymoses, fractured pelvis, left radius and ulna fracture, large scrotal hematoma, 100 x 80 mm laceration of scalp in right parieto-occipital area, multiple abrasions, contusions and lacerations to face, head, shoulders arms, chest, buttocks and thighs | Fatal |
| F-2 | Female | 22 | 65” | 125 lbs | Fractured pelvis, left femur fracture, kidney laceration, liver laceration, multiple abrasions, contusions, and lacerations | Fatal |
| M-3 | Male | 44 | 68” | 180 lbs | Massive subgaleal and sub-periosteal | Fatal |

[20] All heights and weights, except the pilot’s height and weight, were based on the self-reported height and weight on the risk contract in the FAA Information (NTSB Docket) and also in Table 3.
[21] An undeployed parachute was with the body.

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | hemorrhage, subdural and subarachnoid hemorrhage, right periorbital ecchymosis, right clavicle dislocation, right rib 1-10 fractures at anterior aspect, left rib 4-5 fractures at anterior aspect, bilateral hemothoraces, bilateral lung contusions, partial aorta transaction,T8 fracture, spinal cord transaction at T8, spleen contusion, liver contusion, multiple contusions, abrasions and lacerations to the head, chest, and extremities | |
| F-3 | Female[21] | 38 | 63” | 180 lbs | Atlanto-occipital fracture, mandible fracture, T3 fracture, left nose fracture, maxillae fracture, anterior cranial fossae fracture, bilateral periorbital ecchymosis, right ulna and radius fracture, right tibia and fibula fracture, multiple abrasions to the face, anterior neck, and right hand, multiple contusions to anterior surfaces of both legs and thighs | Fatal |
| M-4 | Male | 45 | 70” | 195 lbs | Cerebral concussion, C6 spinous process fracture, T5 burst fracture with complete spinal cord injury at T4, T12 compression fracture, L1 burst fracture, multiple lumbar spine transverse process fractures, multiple bilateral rib fractures (left 3, 5, 6, 7, 9 and right 3, 4, 5, 6, 7, 8, 10), sternal fracture, right hemopneumothorax, bilateral lung contusions, splenic laceration, oral laceration 4cm, chin laceration 3.8 cm, multiple contusions | Serious |

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