



# NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering  
Washington, DC

## **Injury Factual Report**

**February 11, 2022**

Mary Pat McKay, MD, MPH  
Chief Medical Officer

### **A. ACCIDENT: WPR21FA143; Palmer, AK**

**Date and time:** March 28, 2021

**Injuries:** 5 fatal, 1 serious

### **B. GROUP IDENTIFICATION**

Group Chairman

Mary Pat McKay, MD, MPH

Chief Medical Officer, NTSB

Group Member

Marie Moler

Mechanical Engineer, NTSB

### **C. DETAILS OF INVESTIGATION**

#### Purpose

This investigation was performed to document the occupants' injuries.

#### Methods

For the deceased, autopsy reports describing injuries were reviewed. For the survivor, records of his post accident medical care were reviewed. Injuries were coded using the abbreviated injury scale (AIS) system which applies a severity score of 1 (minimal) to 6 (maximal) to each injury; these are grouped into nine body regions.<sup>1,2</sup> Because two of the

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<sup>1</sup> The likelihood of surviving an injury is related to the injury severity level. On average, if a person has a single AIS 1 injury, their likelihood of survival is 99.3% while if they have a single AIS 6 injury, their likelihood of survival is 21%. (The survival risk ratio for a single injury, which is the number of survivors with an AIS level injury divided by the total number of people with that level injury, ranges from 0.993 for AIS 1 to 0.210 for AIS 6.)

<sup>2</sup> Gennarelli T, Wodzin E, editors. AIS 2005 Update 2008. Association for the Advancement of Automotive Medicine, B., IL 2008.

deceased occupants (the two ski guides) underwent only external inspections rather than full autopsies and the inspection reports incompletely document their injuries they were not included in this report. They were seated in the left front seat and the left aft seats.

### Injury AIS Coding

<b>33 year old Male DeceasednPilot Injuries – Right Front Seat</b>			
<b>Body Region</b>	<b>Injury</b>	<b>AIS15 Code</b>	<b>AIS Severity Score</b>
<b>External</b>	Forehead contusion 10 by 4 cm	210402	1
	Contusion of the anterior neck	310402	1
	Abrasion anterolateral left chest 10 x1.5 cm	410202	1
	Abrasion of the lateral left chest/abdomen 13 x 2 cm	410202	1
	Contusion of the posterolateral left abdomen 9 x 0.3 cm	510402	1
	Abrasion of the right lower quadrant of abdomen 8 x 3 cm	510202	1
	Abrasion of the left hip 12 x 4 cm	810202	1
	Contusion of the mid back to right lower back 33 x 13 cm	410402/510402	1
	Contusion of the left buttock 6 x 4 cm	810402	1
	Multiple abrasions of the upper extremities	710202	1
	Multiple contusions of the upper extremities	710402	1
	Multiple abrasions of the lower extremities	810202	1
	Multiple contusions of the lower extremities	810402	1
	<b>Head/Neck</b>	Subarachnoid hemorrhage right frontal and lateral temporal lobes LOC unknown	140693
Subarachnoid hemorrhage left parietotemporal area, “mild,” LOC unknown		140693	2
<b>Chest<sup>3</sup></b>	Hemothorax, right, 150 cc	442200	3
	Hemothorax, left, 50 cc	442200	3
	Fractures lateral right ribs 8 and 9	450202	2
	Hemomediastinum	442208	2
	“Extensive” contusion of right chest wall – 4 <sup>th</sup> – 7 <sup>th</sup> ribs	450289	1
	Contusion of left lower chest wall near insertion of diaphragm	450289	1

<sup>3</sup> Pulmonary contusion is listed in the autopsy report on the list of blunt force injuries but not further described in the body of the autopsy report.

<b>56 year old Male Deceased Passenger Injuries - Aft Passenger Far Right Seat</b>			
<b>Body Region</b>	<b>Injury</b>	<b>AIS15 Code</b>	<b>AIS Severity Score</b>
<b>External</b>	Subgaleal contusion	110402	1
	Contusion of the anterior neck	310402	1
	Scattered facial abrasions	210202	1
	Abrasions and contusions of torso	410202	1
	Multiple abrasions of the upper extremities	710202	1
	Multiple contusions of the upper extremities	710402	1
	Multiple abrasions of the lower extremities	810202	1
	Multiple contusions of the lower extremities	810402	1
<b>Head/Neck</b>	A few scant areas of subarachnoid hemorrhage are present over the cerebral hemispheres LOC is unknown	140693	2
	Non-displaced fracture of the mid cervical vertebrae	650216	2
<b>Chest</b>	Hemothorax, right, 950 cc	442200	3
	Hemothorax, left, 150 cc	442200	3
	Diaphragm hemorrhage, bilateral	440602	2
	Fractures of anterolateral left ribs 8 and 9	450202	2
	Fractures of the right posterior 4th through 9th ribs, the right lateral 4th through 6th and 8th ribs (flail)	450212	3
	Hemomediastinum	442208	2
	Scattered contusions of both lungs; right-greater-than-left, predominantly posterior, up to 2 inches	441410	3
	Lacerations of right lower lobe, up to 1 inch.	441431	3
<b>Abdomen/Pelvis</b>	Multiple lacerations of the right posterior lobe of the liver, up to 11.5 cm; Lacerations of right lower lobe, up to 2.5 cm	541824	3
	Several lacerations of the posterior spleen, up to 2.5 cm	544220	2
	Left perinephric hemorrhage	541612	2
	Right perinephric hemorrhage	541612	2

<b>49 year old Male Deceased Passenger Injuries - Aft Middle Left Seat</b>			
<b>Body Region</b>	<b>Injury</b>	<b>AIS15 Code</b>	<b>AIS Severity Score</b>
<b>External</b>	Forehead abrasion 2.5 x 0.2 cm	210202	1
	Facial abrasion, left cheek, 5 x 0.2 cm	210202	1
	Contusion, right temple	210402	1
	Contusions, anterior chest wall	410402	1
	Multiple abrasions of the upper extremities	710202	1
	Multiple contusions of the upper extremities	710402	1
	Multiple abrasions of the lower extremities	810202	1
	Multiple contusions of the lower extremities	810402	1
<b>Head/Neck</b>	Focal subarachnoid hemorrhage of the right frontotemporal region LOC is unknown	140693	2
<b>Chest</b>	5 x 5 x 5 cm deep contusion of the left lower lung lobe with small associated lacerations	441408	3
	Left pneumothorax	442202	2
	Contusion right lower chest wall by diaphragm	450289	1

<b>48 year old Male Surviving Passenger Injuries – Aft Middle Right Seat</b>			
<b>Body Region</b>	<b>Injury</b>	<b>AIS15 Code</b>	<b>AIS Severity Score</b>
<b>External</b>	Frostbite, deep, bilateral hands, all 10 fingers	915006	3
	Right hand skin tear/abrasion	710202	1
	Contusion Right knee	810402	1
	Contusion left knee	810402	1
	Hypothermia, 28 °C	010008	4
<b>Chest</b>	Hemopneumothorax, left, large pneumothorax with small hemothorax	442205	3
	Fractures of left ribs 4-8 and 11 rib with flail segments of ribs 5 and 6, displaced up to 10 mm. Fractures of right ribs 5-10	450203	3
	Left lower and bilateral upper lobe lung contusions	441411	3

### **Injury Severity Scores**

As another measure of severity, an Injury Severity Score (ISS) was calculated for each of the occupants with AIS coded injuries. The ISS predicts the likelihood of survival among traumatically injured and can be used to compare the severity of injury among individuals. In order to calculate the ISS, the AIS coded injuries are divided into six regions: 1) head/neck, 2) face, 3) chest, 4) abdominal and pelvic contents, 5) extremities and pelvic bones, and 6) external. Then, the ISS is calculated by adding together the squares of the maximum AIS (MAIS) scores for each of the three highest scoring body regions ( $ISS = (MAIS_{regionA})^2 + (MAIS_{regionB})^2 + (MAIS_{regionC})^2$ ). The maximum survivable score is 75.<sup>4</sup> Injuries coded to a severity of 9, unknown severity, preclude the determination of an ISS. Injury severity scores are routinely divided into four groups: minor (ISS 1-8), moderate (ISS 9-15), severe (ISS 16-24), and very severe (ISS  $\geq 25$ ).<sup>5</sup> The risk of death from injury increases with increasing injury severity scores.

These are the calculated Injury Severity Scores for the occupants in the helicopter who underwent AIS coding:

<b>Person</b>	<b>Injury Severity Score (ISS)</b>
33 year old pilot (deceased)	14
56 year old passenger (deceased)	22
49 year old passenger (deceased)	14
48 year old passenger (survivor)	25

According to the Survival Factors investigation, para-rescueman (prehospital medical care provider) did not arrive at the scene to perform initial triage and treatment until 23:30, about 5 hours after the accident occurred. During that time, according to the Meteorology Specialist's

<sup>4</sup> Baker SP, O.N.B., Haddon W, et al., The Injury Severity Score: a method for describing patients with multiple injuries and evaluating emergency care. J Trauma, 1974. 14:187-196.

<sup>5</sup> American College of Surgeons. National Trauma Data Bank 2016 Annual Report. Executive summary. Available from: <https://www.facs.org/quality-programs/trauma/tqp/center-programs/ntdb/docpub>

Factual Report, the accident occurred at approximately 6,622 feet above mean sea level (msl). Winds were about 10-15 knots from the north and temperatures were about freezing but were measured at 249 feet msl. No direct temperature measurements were made at the accident location on the evening it occurred. Sunset occurred at 20:34 that evening.

Environmental cold is particularly dangerous for traumatically injured people; hypothermia may be associated with a 3 times higher risk of death from the similar injuries.<sup>6</sup>

#### **D. SUMMARY OF FINDINGS**

The specific injuries for the 3 helicopter occupants who died and underwent complete autopsies as well as for the 1 survivor were reviewed and described. All were significantly injured.

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<sup>6</sup> Hui-Shan Wang and Jin-Song Han. Research Progress on Combat Trauma Treatment in Cold Regions. Military Medical Research. 2014;1-8