National Transportation Safety Board
Office of Aviation Safety
Washington, DC

September 7, 2011

Survival Factors Specialist's Factual Report of Investigation

A.	Accident	:	DCA11IA015
	Location	:	Jackson, Hole, Wyoming
	Date	:	December 29, 2010
	Time	:	1138 MST [1]
	Airplane	:	Boeing 757-223, N668AA, flight 2253
	Operator	:	American Airlines

B. Survival Factors Group

No group was formed.

C. Summary

On December 29, 2010, at approximately 11:38 Mountain Standard Time (MST), American Airlines flight 2253, a Boeing 757-200, registration N668AA, overran runway 19 upon landing at Jackson Hole Airport (KJAC), Jackson Hole, Wyoming. The airplane came to rest approximately 730 feet past the Runway 19 departure threshold, in deep snow. There were no injuries to the 179 passengers and 6 crew members on board and the airplane received minor damage. The 14 Code of Federal Regulations Part 121 regularly scheduled passenger flight had originated from O'Hare International Airport, Chicago, Illinois.

The passenger manifest supplied by American Airlines indicated that there were four lap children on board the airplane. [2]

[1] All times are reported in Mountain Standard Time unless otherwise noted.

[2] The ages and seating locations of the lap children were 2 mos. (26F), 6 mos. (30B), 20 mos. (19F), and 23 mos. (24F).

D. Details of the Investigation

1.0 Airplane Configuration

The airplane was configured with 22 first-class passenger seats, 166 coach-class passenger seats, 2 cockpit flight crew seats, an aft-facing single flight attendant jump seat on the forward bulkhead, a single, aft-facing flight attendant jumpseat forward of row 9, and three aft-facing flight attendant jumpseats in the aft-galley, adjacent to the aft exit doors. The airplane had three pairs of Type I floor-level exit doors; one pair in the forward galley, one pair at row 9, and one pair in the aft galley. There were two pairs of Type III exits at rows 17 and 18 (Figure 1).

2.0 Crew Information

2.1 Cockpit Crew Interviews

Summaries of flight crew interviews are included in the Operations/Human Performance Group Chairman's Factual Report.

2.2 Cabin Crew

Flight Attendant and Position	Date of hire	Recurrent Training Completion Date	FAA Certification Number
FA 1 - door 1 – fwd galley	06-15-1987	05-13-2010	Not available
FA 2 – door 3 - aft galley	08- 22-1991	09-30-2010	Not available
FA 3 – door 2 – mid galley	12-16-1988	09-17-2010	Not available
FA 4 – door 3 – aft galley	11-15-2000	04-15-2010	Not available

2.2.1 Cabin Crew Statements

Cabin crew statements were provided by American Airlines and were added to this report verbatim.

FA # 1
Female
Age: 47

Flight 2253 was uneventful through final approach. Landing, initial touchdown was "soft", normal, speed seemed abnormally high, and the normal feeling of braking was absent. I felt a bit of sway, and bumpiness prior to coming to an abrupt halt. Once we came to a complete stop, I remained strapped into my jumpseat and awaited instruction from the cockpit crew as I did not see any reason to initiate an evacuation due to absence of fire and/or smoke. Captain Kalsevic almost immediately came on the p.a. to say "passengers stay on the plane"...."flight attendants stay on the plane". I remained seated and then Captain Kalcevic exited the cockpit to ask if I was okay prior to proceeding down the entire length of the cabin to assess well

being of the rest of the crew and passengers. He briefly described what had happened, mentioning that the reverse thrust did not appear to engage, and also apologized. It was approximately another hour before ground personnel were able to approach the aircraft with the rampstand to deplane customers. I thanked everyone on the plane for their patience, calmness and cooperation during this event. Captain Kalcevic remained at the deplaning door throughout the entire process to shake hands and apologize. This event probably couldn't have been handled any better under the circumstances.

FA # 2
Male
Age: 46

Upon landing at JAC flt 2253 lost braking, slats and trust reversal during rollout. The aircraft over ran the runway proper approximately 600ft. Coming to rest in moderate snow a PA was made by the Captain for passengers and crew to remain onboard the aircraft. During this time a burning smell was observed throughout the aircraft which quickly dissipated. After a 35min wait the aircraft was deplaned through the 1L door via ramp-stands.

FA # 3
Female
Age: 46

Landed in Jackson Hole and the aircraft went beyond the end of the runway. When we came to a complete stop, the Captain advised the flight attendants over the p.a. to remain seated until further advised.....he then came over the p.a. again to explain the situation and asked everyone to remain in their seats. No one was injured. There was no evacuation by slides. Eventually a ramp stand was brought to the 1L door, and passengers were deplaned in an orderly manner and brought to the terminal by busses.

FA # 4
Female
Age: 42

This report has NOTHING to do with flight attendants not following procedures. I am writing to report an incident which upon landing in JAC on 12/29/10 at 11:40 am, the brakes on the 757 aircraft we were working, failed. We subsequently, skid over 300 feet from the landing strip. No passengers were hurt and no evacuation was necessary. The captain kept us updated, flight attendants stood near their doors and were ready to evacuate if the need arose. It didn't. We are all safe and thankful this ordeal ended with no injuries to passengers or crew.

3.0 Passenger Information

3.1 Passenger manifest

As stated above, the passenger manifest supplied by American Airlines noted that there were four lap children on board the flight. However, the entry on the manifest for “total on

board" did not include lap children, and immediately following the overrun, the passenger total supplied to Jackson Hole Airport officials, Jackson Hole Airport rescue and firefighting crews, and NTSB, also did not include lap children. Subsequently, in verbal and written requests from NTSB staff to confirm passenger total, American Airlines did not include the lap infants in the passenger total.

Title 14 of the Code of Federal Regulations (14 CFR) part 121, section 121.693 requires that all certificate holders prepare a load manifest that includes, at the time of takeoff, the names of passengers (unless the passenger names are maintained by some other means). According to FAA InFO 08040, FAA Action Notice 8430.29 (December 30, 1988) was issued to provide guidance on a recent legal interpretation of 14 CFR section 121.693(e), regarding the manifest accounting of all non-crewmembers, and the recording of passenger names. The guidance from the Action Notice was codified as Air Carrier Operations Bulletin (ACOB) No. 8-91-2, *Accident Notification and Manifest Accounting Procedures*, which states, in part:

> "The principal reason for this regulation [14 CFR section 121.693(e)] is to facilitate the rapid and accurate determination of how many passengers are on board an aircraft, and who they are, in the event of an emergency situation such as an accident or hijacking."

Further, the ACOB states:

> "The word 'passenger,' as used throughout the Federal Aviation Regulations, means any passenger, regardless of age. That interpretation also states that the word passenger, as used in Section 121.693 is not qualified, and means any passenger."

4.0 Description of site

Refer to the Structures Group Chairman's Factual Report for a description of the accident site.

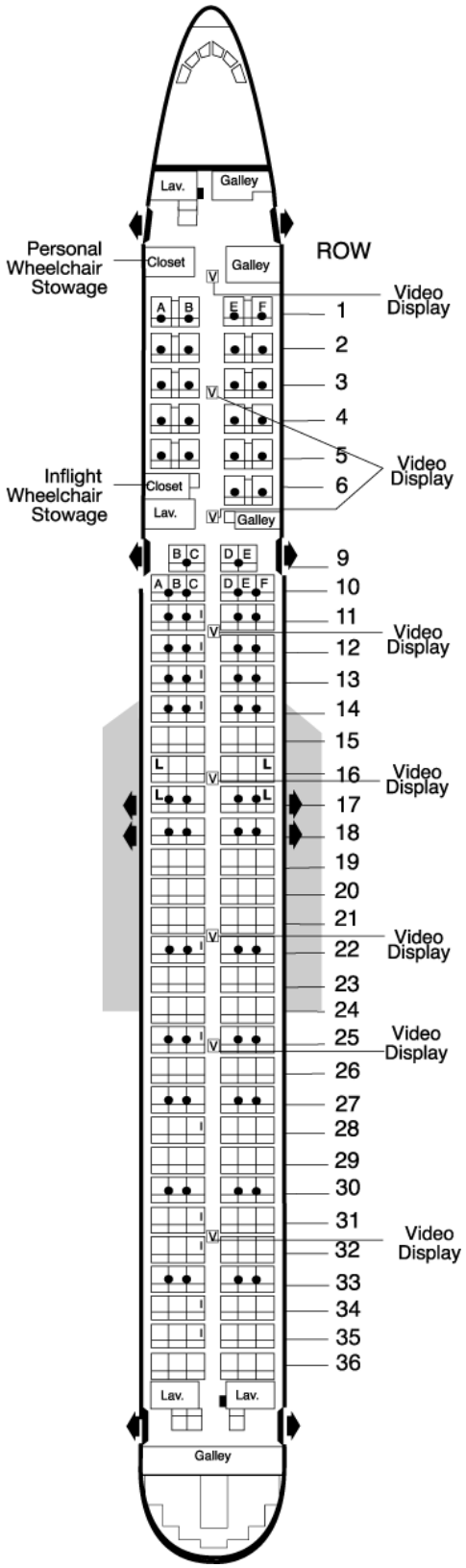
5.0 Airplane Documentation

The airplane was not observed.

6.0 Medical and Pathological

5.1 Injury Table

Injuries	Flight Crew	Flight Attendants	Passengers	Total
Fatal	0	0	0	0
Serious	0	0	0	0
Minor	0	0	0	0
None	2	4	179	185
Total	2	4	179	185


Lav.
Galley
Personal Wheelchair Stowage
Closet
Galley
ROW
Video Display
A B
E F
1
2
3
4
5
6
Video Display
Inflight Wheelchair Stowage
Closet
Lav.
Galley
B C
D E
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Video Display
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31
Video Display
32
33
34
35
36
Lav.
Lav.
Galley

Figure 1. B-757-200 interior configuration

7.0 Airport Information

Jackson Hole Airport (JAC) was located approximately 7 statute miles north of Jackson, Wyoming, and was a publicly-owned entity, operated by the Jackson Hole Airport Board, on land leased from the US Park Service. The airport property encompassed approximately 533 acres at an elevation of 6,451 feet above sea level. In 2009, JAC had approximately 30,865 total aircraft operations, of which 14,656 were air carrier and air taxi operations. The FAA certified JAC as a 14 CFR Part 139 airport with Index B aircraft rescue and firefighting (ARFF) capabilities. The most recent FAA Part 139 inspection was completed on July 1, 2010, and no discrepancies related to winter operations were noted. The FAA Airport Certification Inspector assigned to JAC sent a close-out letter to JAC management on February 11, 2011, regarding the AAL 2253 overrun. The letter reviewed the circumstances of the overrun, and determined: "Airport operator was not in violation of 14 CFR Part 139. Commencement of snow removal was timely, notifications were prompt."

There was one runway available at JAC (Figure 2); Runway 01/19 was 6,300 feet in length by 150 feet wide, was paved with porous friction course (PFC) asphalt, and had high-intensity runway edge lighting installed. The runway also had precision instrument markings, medium intensity approach lighting systems (MALS), and precision approach path indicators (PAPI, set at 3 degrees), for operations on both Runway 01 and Runway 19. Runway 19 was equipped with an instrument landing system (ILS). The runway had lighted distance remaining signs, every 1000 feet, in both directions. Both runway ends had runway safety areas measuring 500 feet by 1000 feet beyond the thresholds, in accordance with FAA Advisory Circular 150/5300-13, *Airport Design*, Table 3-3, *Runway Design Standards for Aircraft Approach Categories*. The runway also had 300-foot concrete blast pads extending beyond the thresholds at both ends. The runway slope was -0.6%, from north to south, with a drop in elevation of 38 feet over the 6,300 foot runway length.

On November 8, 2010, the FAA convened a working group to examine the number of runway excursions that have occurred at JAC in recent years, identify root causes of the excursions, and identify best practices in order to reduce the number of future excursions. The working group consisted of more than 100 participants from FAA Northwest Mountain Flight Standards, Northwest Mountain Airports Division, Northwest Mountain Office of Runway Safety, the Wyoming Department of Transportation, Jackson Hole Airport, FAA certificate management teams from the appropriate district offices, FAA certificate holders, and other industry groups. To date, the working group has drafted a final report, a Safety Alert for Operators (SAFO), and an FAA Notice. The documents were reportedly under review by FAA headquarters personnel at the time this report was completed, therefore, were not available for examination.

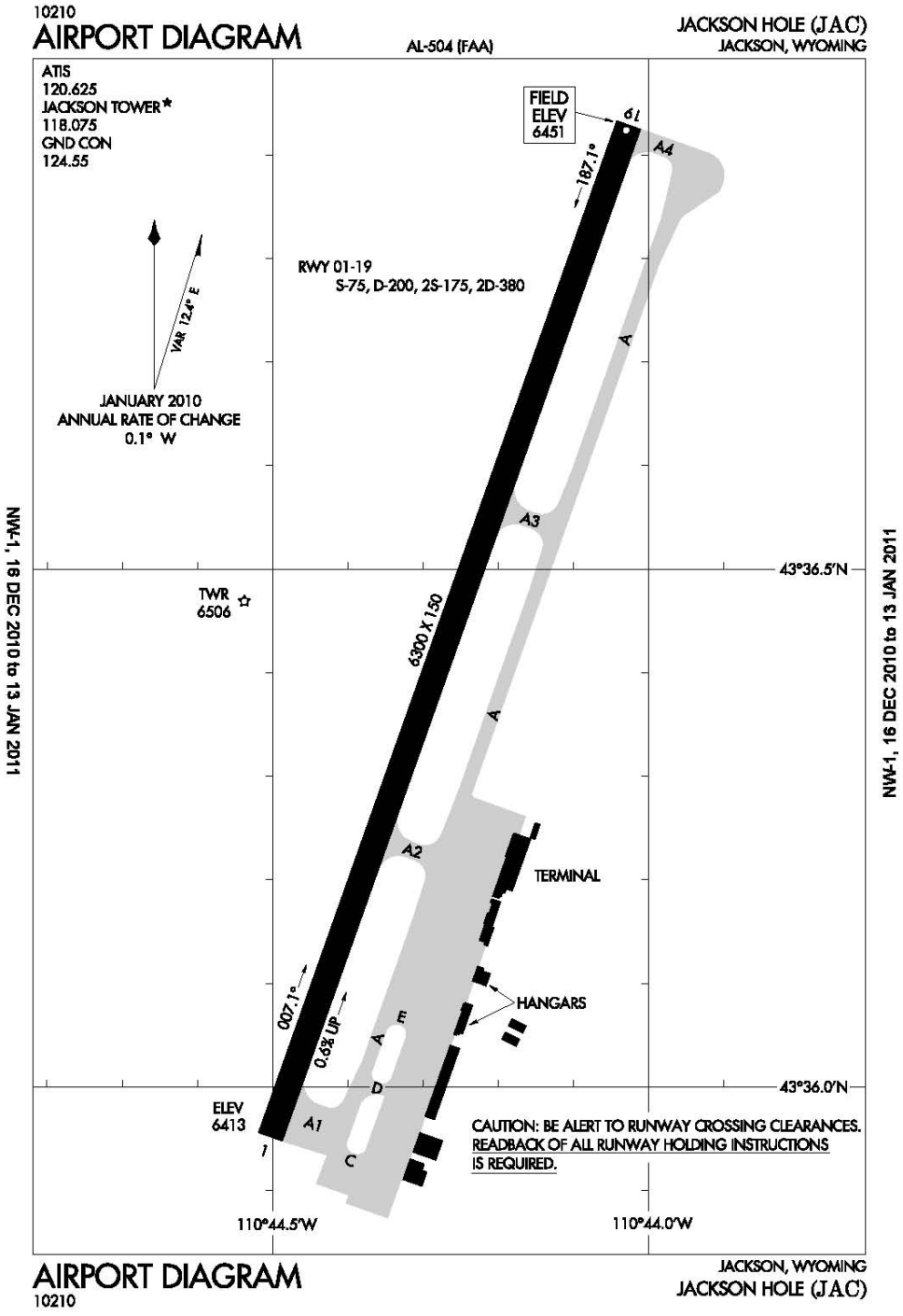

Figure 2. JAC Airport Diagram

7.1 Airport Construction Projects

The JAC Director of Operations stated that the airport is currently planning three construction projects[3] intended to help prevent future overruns, or to improve safety if an overrun does occur:

1) Installation of 700 feet of additional pavement beyond the existing 300 foot blast pad in the runway safety area at the end of Runway 19 (construction to commence in 2011).
2) Installation of runway centerline lighting to provide better runway visibility and alignment information, plus indication of runway distance remaining.[4] Also, a duplicate set of runway distance remaining signs will be installed, so that they will be visible on both sides of the runway (construction to commence in 2011).
3) Installation of a visual reference on the runway as an indication to landing pilots that, unless a certain deceleration profile has been achieved, a go-around is warranted (design and funding not yet completed).

7.2 Airport Winter Operations

The Airport Certification Manual (ACM) for Jackson Hole Airport contained a required chapter entitled *Snow and Ice Control Plan - Jackson Hole Airport*.[5] This chapter outlines the responsibilities, procedures and activities used by JAC operations when winter precipitation occurs on the airfield. According to the JAC snow and ice control plan, the airport director or his designated representative is responsible for the following:

1) Ice, snow, and slush shall be removed as completely as practicable from appropriate air carrier movement areas.

2) In the event of heavy snow accumulation, the height of snow banks alongside usable runway, taxiway, and ramp surfaces must be such that all aircraft propellers, engine pods, rotors, and wing tips will clear each snow drift and snow bank when the aircraft's landing gear traverses any full-length portion of the movement area.

3) In the event that the snow removal crew is unable to comply promptly with the requirements stated above, the airport director or his representative will issue a NOTAM to describe the conditions and provide a copy of said NOTAM to each air carrier and fixed base operator.

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[3] Additional information is available on the airport's website: www.jacksonholeairport.com

[4] Runway centerline lights are white in the middle of a runway, transition to alternating red and white lights beginning 3,000 feet from the end of the runway, and transition to all red lights 1,000 feet from the runway end.

[5] FAA approval date: February 28, 2010.

4) Snow removal operations shall commence when a minimum of ½ inch of slush/wet snow, two inches of dry snow, or any ice or freezing rain accumulates on the airfield, such that appropriate air carrier movement areas are available at the time of air carrier operations.

5) The active runway will be monitored at all times during snowfall. If continuing snowfall requires replowing, necessary equipment will be diverted to maintain the runway.

6) Prior to commencing snow removal operations the fixed base operators, air carriers, and Lockheed Martin Prescott, AZ hub will be notified.

7) The runway, parallel taxiway, aircraft parking apron, and airport access/emergency roads will be plowed concurrently and receive highest priority.

8) In the event of an emergent evacuation of person(s), air and/or ground ambulances will receive priority consideration, and snow removal equipment will provide access and egress to such vehicles for the safe and efficient transportation of their patients.

9) Snow removal will commence around runway and taxiway lights when the snow depth reaches the base of the glass lens or globe.

10) The glide slope area should be evaluated by the Airways Facility Sector Field Unit Office. If personnel from that office are unavailable, the airport director or his designated representative should evaluate the area and notify the Airway Facilities manager at (phone number deleted) before moving equipment into the area.

Requirements for Runway Closure

According to the JAC snow and ice control plan:

Runways receiving a NIL braking (either by PIREP or by a braking action assessment by the airport operator) are unsafe for aircraft operations. Airport operations shall issue a NOTAM to close Runway 01/19 when:

a) The tower relays a pilot report of NIL braking;
b) A friction assessment conducted by the airport using either the SARSY [Saab SFT] or the Tapley Meter indicates a *mu* less than or equal to .20 on any 1/3 of the runway;
c) Airport operations directly receive a pilot report of NIL braking as a result of continuous monitoring;
d) 6” accumulation of any contaminant.

Continuous monitoring

According to the JAC snow and ice control plan, continuous monitoring procedures are put in place during air carrier operations when there is precipitation or

blowing snow. Continuous monitoring consists of frequent inspections of movement area surfaces by airport operations and can be accomplished visually and by friction assessment. In addition, outside of the JAC ATCT hours of operation, continuous monitoring shall include monitoring radio traffic for pilot reports of braking action.

Letter of Agreement

The JAC snow and ice control plan includes a Letter of Agreement (LOA) between the airport and the Jackson Hole control tower. The LOA outlines the requirements that each entity must fulfill related to communication of airport conditions or pilot reports to the other entity. The LOA is in Attachment 1.

Snow and ice control equipment

The JAC snow and ice control plan listed the following equipment available for snow and ice removal:

1) One 1999 Caterpillar 1T62G rubber tired loader
2) Two 1995 Oshkosh plow trucks
3) One 1994 Oshkosh rotary blower
4) One 2006 Oshkosh rotary blower
5) One 1996 Caterpillar 824G dozer
6) One 1997 Gehl 4625SX skid-steer loader
7) Two 2008 RS-400 Overaasen brooms
8) One 2003 Sterling plow/sand truck
9) One 2006 Caterpillar 824H dozer

JAC also had two friction testers for assessing runway friction, a Saab 9-5 SFT[6] (serial no. 829), and a Tapley decelerometer. The Saab SFT was used to take friction readings before and after the subject overrun. Details of friction measuring equipment operation and reporting are contained in the JAC snow and ice control plan.

8.0 Sequence of Events

According to National Weather Service observations, “snow” or “light snow” had been reported at JAC since about 08:00 AM on the day of the accident. JAC operations reported that snow removal activities had been ongoing all morning due to the snow, and “brooms and plows” were used. JAC does not maintain a dedicated “snow log” that chronicles snow removal activities, so it was not known when or how often the runway was treated. However, Notices to Airmen (NOTAMs) were issued periodically which recorded field conditions and runway friction measurements. The NOTAMs were disseminated to the JAC ATC tower, the FAA Flight Service Station contractor (Lockheed Martin – Prescott, AZ), airport tenants, and airlines. The following table contains information taken from the NOTAMs sent on 12-29-2010 by JAC Operations. Note: the

[6] JAC records indicate that the SAAB SFT was inspected and calibrated on 2-9-2010.

after-incident runway friction measurements taken at 11:41 were in accordance with FAA Advisory Circular 150-5200-30C, *Airport Winter Safety and Operations* (Section 5.3, b, 3).[7]

Time	Rwy 19 *mu*	Rwy 19 Conditions	Comments
08:15	29 - 38 - 38	Thin loose snow over patchy thin packed snow and ice	Currently snowing – snow removal operations in progress
10:10	45 - 54 - 32	Thin loose snow over patchy thin packed snow and ice	Currently snowing – snow removal operations in progress
11:03	43 - 43 - 39	Thin loose snow over patchy thin packed snow and ice	Currently snowing – snow removal operations in progress
11:41	40 – 45 - 40	Thin loose snow over patchy thin packed snow and ice	SFH [sic] Mu values and conditions post American Airlines overrun

According to a statement from JAC operations personnel, the overrun was witnessed by the driver of the Saab SFT, who was on Taxiway C, awaiting the arrival of the American Airlines flight. The overrun occurred at approximately 11:35. He recalled that the airplane was "travelling at a high rate of speed" and he "assumed that the aircraft was going to go off the end of the runway." He announced on JAC frequency that the airplane "was going to overrun the runway, and that an ARFF response was needed."

The airplane stopped approximately 730 feet south of the Runway 19 departure threshold.[8] The Saab SFT driver contacted the pilot on tower frequency and asked about "damage, fire, and injuries." The pilot was not aware of any, and the Saab SFT driver relayed that information to the responding ARFF trucks. The ARFF trucks were on scene at approximately 11:37. Three ARFF trucks and ten firefighters responded. No extinguishing agents were used.

At about 12:00, JAC operations "received permission" from NTSB to allow snow crews to remove snow from around the airplane in order to remove the passengers. At about 12:10, American Airlines placed their air stairs at the left front door of the airplane and began deplaning passengers. The passengers were bused to the terminal by Altrans Transportation buses.

At about 13:10, JAC operations "received permission" from NTSB to move the airplane. Snow crews removed snow from behind the airplane, and American Airlines personnel towed the airplane to the south end of the general aviation ramp. At

[7] [When to conduct runway friction assessments on contaminated runways] Immediately following any aircraft incident or accident on the runway, recognizing that responding ARFF or other circumstances may restrict an immediate response.

[8] As measured from the runway threshold to the airplane's nose landing gear.

approximately 14:00, the runway was inspected, and the runway was reopened shortly thereafter.

9.0 Attachments

1) Letter of Agreement between JAC and JAC ATCT

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Mark H. George
Survival Factors Investigator