# National Transportation Safety Board
# Office of Aviation Safety
# Washington, DC

June 15, 2011

## Survival Factors Specialist's Factual Report of Investigation

| | | | |
|---|---|---|---|
| A. | Accident | : | WPR11IA055 |
| | Location | : | Jackson, Hole, Wyoming |
| | Date | : | November 22, 2010 |
| | Time | : | 09:29 MST [1] |
| | Airplane | : | Gulfstream 200, N718QS |
| | Operator | : | NetJets Aviation, Inc. |

B. Survival Factors Group

No group was formed.

C. Summary

On November 22, 2010, at approximately 09:29 AM mountain standard time, a Gulfstream 200, registration N718QS, operated by NetJets Aviation, Inc., overran runway 19 upon landing at Jackson Hole Airport (KJAC), Jackson Hole, Wyoming. The airplane came to rest approximately 375 feet beyond the Runway 19 departure threshold. There were no passengers on board, and the two flight crew members were not injured. The 14 Code of Federal Regulations Part 91 positioning flight had originated from Bozeman, Montana.

D. Details of the Investigation

1.0 Crew Information

1.1 Cockpit Crew Interviews

Pilot statements are in Attachment 1.

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

## 2.0 Description of site

According to JAC operations, the airplane stopped approximately 375 feet beyond the runway 19 departure threshold, and approximately 45 feet west of the extended runway centerline (measurements taken from left main gear), 75 feet beyond the paved blast pad.

## 3.0 Airplane Documentation

The airplane was not observed.

## 4.0 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 | 0 | 0 | 2 |
| **Total** | 2 | 0 | 0 | 2 |

## 5.0 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 NetJets 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.”

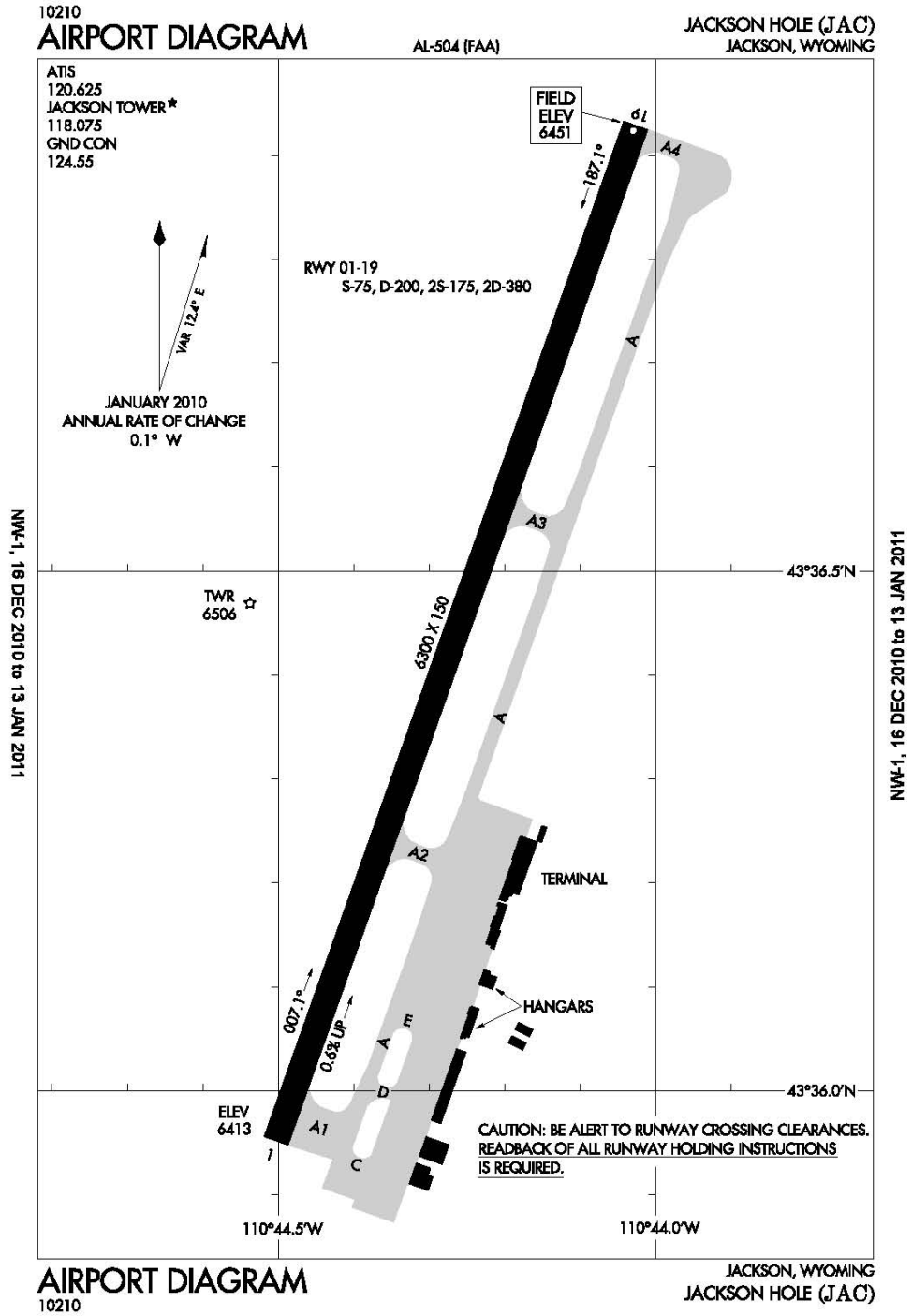


Figure 1. JAC Airport Diagram

There was one runway available at JAC (Figure 1); 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 the recent years, identify root causes of the excursions, and to 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 in the review cycle at FAA headquarters at the time this report was completed, therefore, were not available for review.

### 5.1 Airport Construction Projects

The JAC Director of Operations stated that the airport is currently planning three construction projects[2] 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.[3] 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).

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

[3] Runway centerline lights are white in the middle of a runway, and 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.

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).

### 5.2 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*.[4] This chapter outlined 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.

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.

[4] FAA Approval date: February 28, 2010.

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 2.

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[5] (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.

## 6.0 Sequence of Events

According to National Weather Service observations, "light snow" and "blowing snow" had been reported at JAC since about 07:00 AM on the day of the accident. JAC operations reported that snow removal activities had been ongoing 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 11-22-2010 by JAC operations. Note: evidence of the after-incident runway friction measurements taken at 09:36 is based on printouts from the Saab SFT, and not from an associated NOTAM, therefore field conditions and comments were not available. However, the after-event friction measurement is in accordance with FAA Advisory Circular 150-5200-30C, *Airport Winter Safety and Operations* (Section 5.3, b, 3).[6]

| Time | Rwy 19 *mu* | Rwy 19 Conditions | Comments |
|---|---|---|---|
| 06:30 | 41 - 37 - 36 | Patchy thin loose snow over patchy thin packed snow and ice | Snow removal in progress |
| 09:20 | 40 - 42 - 40 | Patchy thin loose snow over patchy thin packed snow and ice | Snow removal in progress |
| 09:36 | 34 - 33 – 23 | NA | NA |

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

[6] [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.

A snowplow crew supervisor witnessed the overrun. He said that a plow and broom had been clearing snow from the runway, and then exited in order for the subject airplane to land. Another JAC operations stated that the crash phone in the fire station was activated at approximately 09:30 by the JAC tower, and aircraft rescue and firefighting (ARFF) personnel was told that "an aircraft had exited the runway and paved safety area at the rollout end of Runway 19. There was no fire nor injuries, and the aircraft was asking for assistance." JAC operations closed the runway and responded to the scene along with ARFF personnel.

The Saab SFT was used to take runway friction measurements at about 09:36. The snowplow crew removed snow from around the airplane, and it was towed onto the runway at approximately 1035. The airplane taxiied to the ramp under its own power. JAC operations personnel cleared the scene and the runway was reopened at approximately 11:11.

## 7.0 Attachments

1) Pilot statements
2) Letter of Agreement between JAC and JAC ATCT

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Mark H. George
Survival Factors Investigator