NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, DC 20594

SURVIVAL FACTORS SPECIALISTS' FACTUAL REPORT

December 3, 2020

I. ACCIDENT

Operator	:	Peninsula Aviation Services Inc.
Airplane	:	Saab 2000 [N686PA]
Location	:	Unalaska, AK
Date	:	October 17, 2019
Time	:	1740 Alaska daylight time (ADT)[1]
NTSB #	:	DCA20MA002

II. SURVIVAL FACTORS SPECIALISTS

Specialist	:	Jason T. Fedok National Transportation Safety Board Washington, DC
Specialist	:	Noreen Price National Transportation Safety Board Anchorage, AK

III. SUMMARY

On October 17, 2019, about 1740 Alaska daylight time, Peninsula Aviation Services Inc. d.b.a. PenAir flight 3296, a Saab 2000, N686PA, was landing at Unalaska Airport (DUT), Unalaska, Alaska, when the airplane overran the end of the runway, passed through the airport perimeter fence, crossed a road, and pitched down over shoreline rocks with its nosewheel in Dutch Harbor. Of the 42 airplane occupants, 1 passenger sustained fatal injuries. The airplane was substantially damaged. The airplane was operating as a regularly scheduled passenger flight under the provisions of Title 14 Code of Federal Regulations (CFR) Part 121. Visual meteorological conditions prevailed at the time of the accident. The flight had departed from Ted Stevens Anchorage International Airport (ANC), Anchorage, Alaska, at 1523.

[1] All times are reported in local time unless otherwise noted.

IV. DETAILS OF THE INVESTIGATION

1.0 Airplane Information

The accident airplane was configured with a center aisle and 15 rows of passenger seats, numbered 1-16 (omitting row 13). A single seat on the left side of the cabin was designated A and the two seats on the right side of the cabin were designated D (aisle) and F (window). The cabin had one, aft-facing flight attendant (F/A) jumpseat equipped with a four-point restraint forward of the main cabin door. In addition to the main cabin door, the airplane had an aft service door on the right side of the airplane, and two overwing emergency window exits at row 9 (see figure 1).

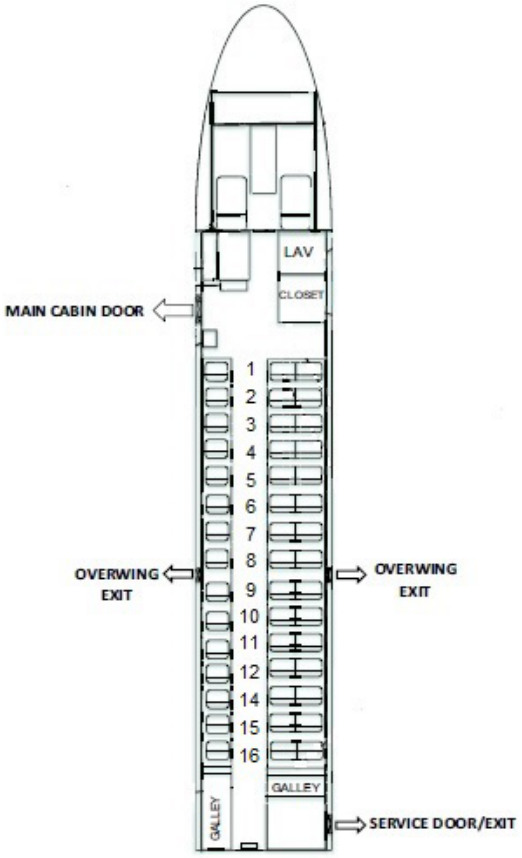

Figure 1. Interior Diagram of N686PA.

2.0 Cabin Documentation[2]

Upon arrival at the scene on October 18, 2019, it was noted that the left propeller had 3 blades separated. Both overwing emergency window exits had been removed and there were blankets on the wings near the exits. The right rear exit door was fully opened. The front left main cabin door was closed. See photos 1, 2, 3, and 4.

[2] The airplane's interior was documented by NTSB investigators Noreen Price and Steve Magladry with the assistance of representatives of Saab.

Photo 1. N686PA in its final resting location.

Photo 2. The right side of N686PA.

Photo 3. The left side of N686PA.

Photo 4. Left overwing exit and impact area of propeller blade.

The damaged area of the cabin was contained within an area on the left side between fuselage station (FS) 399 (seat 3A) and 488 (seat 6A), with extensive damage evident at FS 435, which was mid-window and next to seat 4A's seatback. The left side overhead compartment (FS 399 to FS 488) partially separated from its mounts and descended about 6 to 12 inches. Oxygen generators and debris were hanging down into the seats or laying on the floor in this area. The wall panel separated at FS 399 and was displaced rearward and inboard. The wall panel and fuselage skin infringed about 10 inches into the 4A seat area at the lower seatback cushion. The 4A window fuselage frame was located on the cabin floor at row 2.

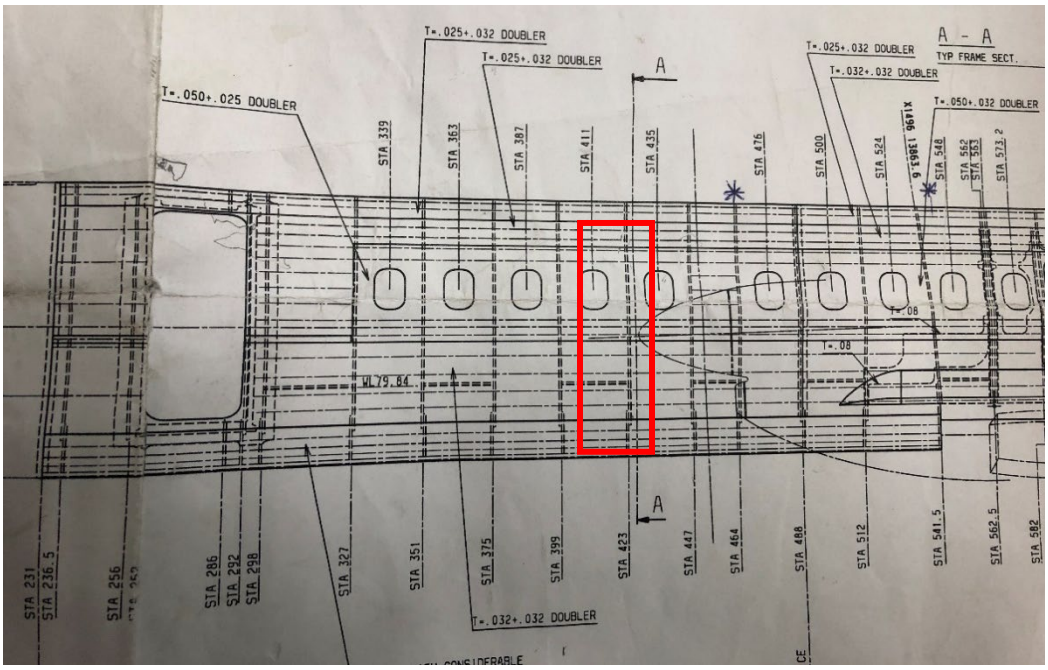

Photo 5. Area of extensive damage near FS 435.

The crew and cabin seats were all intact and secured to the floor. The only seat with substantial damage was seat 4A where the seatback was damaged and displaced inboard toward the center aisle. A propeller blade was firmly in place in a vertical direction in front of the 4F seat. See photos 6-12.

Photo 6. Forward-facing view of cabin from row 8.

Photo 7. Forward-facing view of cabin from row 6.

Photo 8. Interior damage above seat 5A.

Photo 9. Interior damage above seat 4A.

Photo 10. Damage to seat 4A.

Photo 11. Aft-facing view showing inboard displacement of seat 4A's seatback and location of propeller blade near seat 4F.

Seat 4A's seatback was displaced inboard toward the center aisle. The headrest cushion was partially torn away from the seatback, and an 8-inch vertical cut through the foam and cover was evident on the left side, about 4 inches from the top. The bottom seat cushion was ajar. The right armrest was fractured at the forward mount and displaced inboard about 4 inches. The seatbelt (AmSafe P/N 502755-E-2561, M/N 502751-1) was undamaged and functional. The seat cushions were removed and it was noted that the seatback structure was fractured on the left side. The following information was obtained from the seat:

B/E Aerospace, Flight Equipment and Engineering LTD
P/N 928-M1132A-1L, S/N 110351, May 1995
Seat Cushion - Cars Classic, FAA Project SP0256WI-Q-FO3369
Seat Bottom – P/N 112080 01, Batch No. 14206
Life Vest - Eagle Solution, EAM SN H064H60, due May 2022

A propeller blade was in front of the seat 4F. It was wedged between the overhead bin and the floor. With the exception of a fracture and slight displacement of the inboard armrest of seat 4D, there was no damage or scrape marks to the overhead bin, floor, or seats 4D/4F.

Photo 12. Location of propeller blade near seat 4F.

The only other damaged seat was 5D which had a cosmetic X-shaped tear in center (left side) of the seat cushion.

3.0 Cabin Crew Information

The flight attendant (F/A) for the accident flight was hired by PenAir in April 2011 and company records indicated she completed initial training on April 18, 2011. She was qualified on both the Saab 2000 and the Saab 340 and completed Saab 2000 initial aircraft ground training in May 2016. She received her last recurrent training on February 28, 2019 and successfully passed her last line check on May 24, 2019. Prior to her employment at PenAir she was employed as a flight attendant by Era Aviation for about 7-8 years beginning in 1999.

A review of the PenAir flight attendant manual indicated that section 25.8.13.3 dealt with the procedures and commands PenAir flight attendants are trained to use during and unplanned evacuation. An excerpt is included as figure 2.

25.8.13.3 Unplanned Evacuation Duties

Unplanned evacuation duties apply when an accident occurs unexpectedly, usually on takeoff or landing. The Flight Attendant is solely responsible for the organization and evacuation of the passengers. None of the passengers have reason to think there will be a problem, nor do they have the training and expertise to deal with the unexpected. It is critical that the Flight Attendant is able to respond immediately and accurately to the emergency situation. The steps to be followed in an unplanned evacuation should be as familiar to the Flight Attendant as their normal preflight and passenger services. Continuing review of this information must be part of the normal procedures on a daily basis.

25.8.13.3.1 Procedures and Commands

a. Assume your brace position and remain there until the aircraft comes to a complete stop while issuing commands.
b. Command (**YELL**) "**HEADS DOWN!**" "**STAY DOWN!**"
c. Review in your mind the location and operation of exits and procedures.
d. Command (**YELL**) "**HEADS DOWN!**" "**STAY DOWN!**" Repeat both sets of commands until aircraft comes to a complete stop and you begin evacuation.
e. The Flight Attendant will begin an evacuation as soon as the aircraft stops completely. The Flight Attendant will not wait for a signal from the PIC to evacuate in an unplanned emergency situation.

Figure 2. Unplanned evacuation procedures from PenAir's flight attendant manual.

4.0 Accident Summary

The flight attendant and interviewed passengers all recalled a turbulent first approach to DUT. After the missed approach several were expecting to divert to an alternate airport, but the airplane circled for a second approach. Most described the second approach as slightly less turbulent. After touchdown, several occupants indicated they felt they were traveling too fast (or not decelerating fast enough) and realized they were not going to stop on the runway. They reported the airplane turning to the right and eventually coming to a stop on a rock embankment.

Passenger 5F reported that passenger 5A was holding her lap child infant for landing and was able to hold on to the child until the airplane came to a stop.

The flight attendant determined her exit was unusable by looking outside of passenger windows and immediately ordered an evacuation through the right side exits. Interviewed passengers did not specifically remember any evacuation orders from the flight attendant or flight crew but realized an evacuation was necessary and opened the right overwing exit and aft, right service door. Those were the only two exits used during the evacuation. Passengers evacuating out the aft, right service door faced a significant drop to the ground due to the airplane's attitude and lack of an escape means. A passerby assisted with helping passengers to the ground from that exit. Passengers evacuating via the right overwing exit encountered a slippery right wing due to rain that began around the time the airplane stopped moving. It was reported that several passengers fell on the right wing and sustained minor injuries. After the initial evacuation, a ladder was brought to the wing and towels were laid down to provide friction.

The passengers from row 5 and aft evacuated immediately; however, passengers from row 4 and forward (including all three crewmembers) were delayed due to injured passenger 4A who began receiving attention for his injuries from other passengers immediately after the airplane stopped. He was removed from his seat and placed in the aisle, which effectively blocked the egress path for those forward of row 4. After most of the aft passengers had evacuated, a local doctor (who witnessed the accident) boarded the airplane through the right overwing exit and began providing medical assistance. EMTs later boarded the airplane and removed passenger 4A, who was taken to the local medical clinic via ambulance. Only after he was removed (about 19 minutes after the accident) did the remainder of the passengers and 3 crewmembers exit the airplane.

4.0 Medical and Pathological Information

4.1 Injury Table

Injury Classification	Flight Crew	Flight Attendant	Passengers	Total
Fatal	0	0	1	1
Serious[3]	0	0	1	1
Minor	0	0	8	8
None	2	1	29	32
Total	**2**	**1**	**39**	**42**

4.2 Injury Summary

After the accident ten passengers were transported to Iliuliuk Family & Health Services medical clinic, which was about 2.5 miles from the airport. Passenger 4A, who was struck by a

[3] 49 CFR § 830.2 defines serious injury as "any injury which: (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date of the injury was received; (2) results in a fracture of any bone (except simple fractures of the fingers, toes, or nose); (3) severe hemorrhages, nerve, muscle, or tendon damage; (4) involves any internal organ; (5) involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface."

composite propeller blade which entered the cabin after separating during the accident, was pronounced dead shortly after arrival. The State of Alaska's Medical Examiner's Office reported his cause of death to be "blunt impacts of head, trunk and extremities with multiple skeletal and visceral injuries." Passenger 5D had an open fracture of the right fibula and was flown via medevac to Anchorage for treatment. He reported receiving the injury before the airplane came to a stop while he was still in his seat. Seven other passengers were treated and released for minor injuries. One of these passengers (5F) required a surgical procedure to remove a piece of metal shrapnel from his leg several days later in Anchorage. Passenger interviews indicated that at least some of other passenger injuries occurred due to slips and falls during the evacuation, primarily on the right wing which was wet due to rain. See attachment 1 for more information about passenger injuries.

5.0 Airport Information

5.1 General Information

Unalaska Airport (DUT) was located on Amaknak Island and served the City of Unalaska, about 800 miles southwest of Anchorage. The airport was owned and operated by the State of Alaska Department of Transportation and Public Facilities (ADOT&PF), Southcoast Region, and served as a regional transportation hub for the western Aleutian Islands. The airport was physically constrained by Mount Ballyhoo to the north, Dutch Harbor and Iliuliuk Bay to the east, industrial and residential development to the south, and Unalaska Bay to the west.

At the time of the accident facilities at the airport included a single 4,500' x 100' grooved asphalt runway (13/31), two taxiways, two aprons, a passenger terminal (owned by the City of Unalaska), a seaplane ramp, aircraft hangars, and airport maintenance and overhaul facilities. The airport was a commercial service airport certificated under Class I of 14 *Code of Federal Regulations (CFR)* Part 139 and received scheduled air carrier service with a Saab 2000 operated by PenAir.

Figure 3. 2019 Google Earth image of DUT.

5.2 Notices To Airmen (NOTAMs)

The following field condition report NOTAMs were issued and active at the time of the accident.

!DUT 10/056 DUT RWY 13 FICON 5/5/5 100 PCT WET OBS AT 1910171626. 1910171626-1910181626
!DUT 10/057 DUT RWY 31 FICON 5/5/5 100 PCT WET OBS AT 1910171626. 1910171626-1910181626

5.3 Runway Safety Areas (RSAs)[4]

Because DUT was certificated under Part 139, the airport operator, ADOT&PF, was required to comply with FAA Order 5200.8, *Runway Safety Program* to the extent practicable. The site constraints at Unalaska Airport posed significant challenges to complying with the FAA's RSA policies while meeting the airport's desired runway length. According to the DUT Airport Certification Manual (ACM) the airport RSA measured 4650' x 150'. This measurement included designated 300' RSAs at each runway end (marked as displaced thresholds) and a 150' blast pad at the approach end of runway 31. At the time of the accident, FAA Advisory Circular (AC) 150/5300-13A *Airport Design* required a 300' long x 150' wide RSA for Aircraft Design Group (ADG) B-II (Saab 340B) airplanes, 600' x 300' for ADG B-III airplanes, and a 1000' long x 500' wide RSA for ADG C-III (Saab 2000) airplanes.[5][6]

5.4 History of DUT RSAs

The 1982 Unalaska Airport Master Plan was based on potentially accommodating the Boeing 737, then flown by Mark Air, to provide passenger and cargo service between Unalaska and Anchorage. Planning for this aircraft led to the recommended extension of the runway from 4,100 feet to 6,000 feet and widening from 100 feet to 150 feet. The master plan also recommended the addition of 19.5 acres of apron and taxiway, and the relocation of the seaplane ramp. While the apron was eventually expanded and the passenger terminal was built, the runway length and RSA needs identified in the 1982 master plan were not addressed at that time.

In 2004, the ADOT&PF updated plans for the DUT to reflect the Saab 340B as the critical aircraft in response to the changes in air service. PenAir subsequently announced plans to introduce the Bombardier Q400 (ADG B-III) by about 2016. The planned introduction of this aircraft necessitated changes to the planning assumptions. ADOT&PF completed a comprehensive master plan update for DUT in March 2008 with the goal of meeting Airport Reference Code (ARC) B-III standards, including improvement of the RSA to the extent practicable.

[4] The FAA defines an RSA as a "surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." RSAs also provide greater accessibility to firefighting and rescue vehicles during an incident.

[5] The 1000' RSA dimension was required on both of the departure end(s) of the runway.

[6] Certified by the FAA in 1994, the Saab 2000's published wingspan is just over 81 feet and approach speed is more than 121 knots, which qualified it as an ADG C-III aircraft. For more information please see the Operations Group factual report.

In 2008, subsequent to completion of the master plan update, PenAir indicated that the Q400 was no longer being considered due to its high acquisition cost. In early 2009, the airline then considered obtaining U.S. certification for the ADG C-III Saab 2000[7] and ADOT&PF initiated a supplement to the master plan. However, the airline determined that the Saab 340B had proven to be extremely reliable and would most likely remain in service beyond 2016. In consultation with the FAA, ADOT&PF therefore decided to plan for interim improvements that could be achieved by 2015 to better accommodate RSA and runway length needs of the Saab 340B.

Because DUT was categorized as an ARC B-II airport, AC 150/5300-13, Change 15 specified that RSAs were to be 150 feet wide, centered on the runway centerline, and were to extend 300 feet beyond each runway end. The RSAs at DUT measured only 100 feet in length at the approach on runway 30 and 200 feet in length at the approach end of runway 12 and, therefore, did not the meet FAA design standards.

ADOT&PF contracted for RSA practicability study (completed in October 2010) to provide the FAA with an analysis of potential solutions for improving the RSAs at DUT. At the time, both Ballyhoo Road and Airport Beach road were close to the Runway 30 approach end, necessitating a 100-foot displacement of the landing threshold and vehicle control gates on the road. The shore of Unalaska Bay was approximately 40 feet from the approach end of Runway 12, which had a 200-foot displacement (see figures 4 and 5).

Figure 4. 2005 Google Earth image of DUT (prior to construction project).

[7] The DUT RSA practicability study erroneously referred to the SAAB 2000 as a category B-III aircraft.

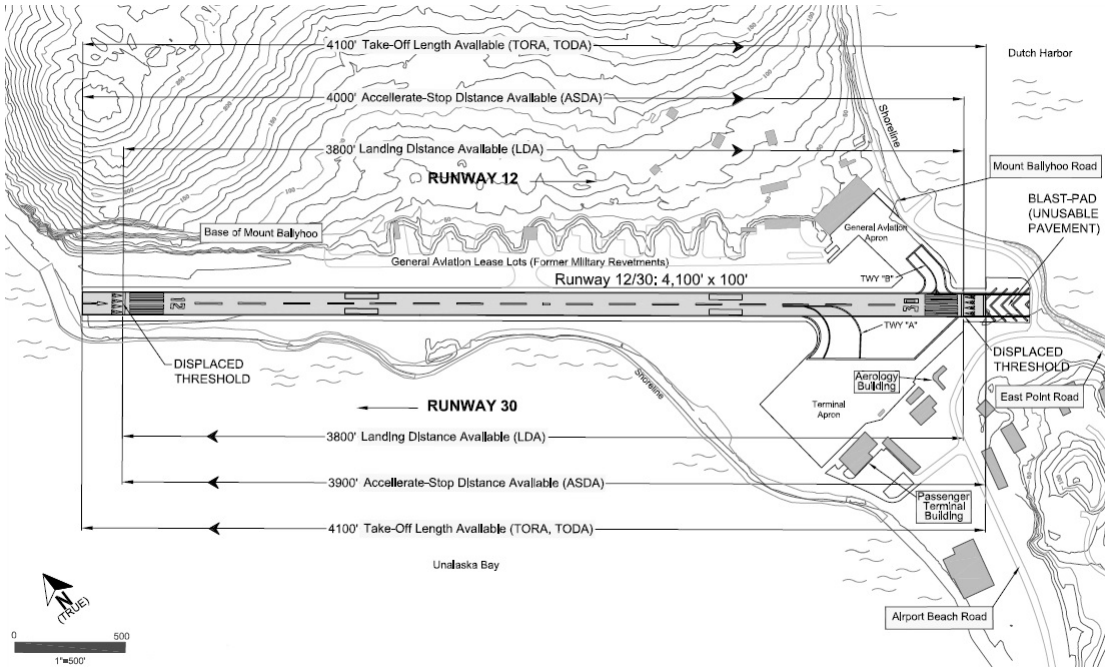

Figure 5. DUT's published distances for runway 12/30 (prior to construction project).

In addition to the need for increased RSAs, the RSA practicability study also considered the concurrent need for additional runway length. DUT established the need for a 4,500-foot runway to allow the Saab 340B to operate at maximum gross weight at up to 68 degrees Fahrenheit. (At the time, 4,100 feet of runway was available for takeoff, frequently limiting aircraft payload.) The study therefore considered:

- Shifting the Runway
- Relocating or Reorienting the Runway
- Reducing Runway Length
- Declared Distances
- Engineered Materials Arresting System (EMAS)

The required environmental assessment for the RSA improvements and proposed runway extension at DUT effectively eliminated the possibility of moving the runway laterally or changing its orientation. In addition, consultation with FAA's Flight Standards Division determined that the existing approach procedures for Runway 30 could not be maintained if the Runway 30 landing threshold were to be moved in either direction. Airspace analysis found that moving the threshold in either direction would worsen the airport's ability to comply with existing Part 77 or FAA design standards such as the threshold siting surface. Collectively, these constraints limited the range of practicable RSA and runway extension alternatives. Given the "extraordinarily high costs and the potential for significant environmental impacts associated with runway and/or RSA extensions northwestward into Unalaska Bay or southeastward into Dutch Harbor," plans for meeting these requirements had to include practicable measures to minimize the length of any extension into these bodies of water.

The RSA practicability study concluded that the construction of full standard RSAs beyond the runway ends exceeded the FAA's financial feasibility threshold. Therefore, full standard RSA options achieved by shifting the runway along its centerline were not practicable. Similarly, relocating or reorienting the runway was previously considered in 2003 and found not to be feasible due to cost ($239 million in 2003 dollars). Reducing runway length was not an option due to the airport's desire for increased runway length and a provision in the 2005 Century of Aviation Reauthorization Act, known as Vision 100, which stated that Alaskan airports "shall not be required to reduce the length of a runway or declare the length to be less than the actual pavement length in order to meet Runway Safety Area standards."

FAA AC 150/5300-13, Change 15, permitted the use of declared distances when it was not practicable to provide a standard RSA. Declared distances worked through the "substitution" of runway pavement not needed for arrival operations for RSA using displaced arrival thresholds. The RSA practicability study found that declared distance alternatives could meet the DUT's B-II RSA standard by displacing the landing threshold at each approach end of the runway by 300 feet to serve as the required RSA for arriving aircraft. The pavement could be used for takeoff in the same direction, thus increasing the runway available for takeoff without increasing pavement length. The use of declared distances minimized the space needed to meet the operational needs of the Saab 340B and the RSA requirements because the landing length requirements were less than takeoff length requirements; accordingly, the necessary RSA length could be fully offset by displacing the landing thresholds.

Numerous declared distance options for meeting RSA and runway length requirements by extension to the north and south were evaluated. After two working sessions with ADOT&PF and the FAA it was determined that the optimal location to provide additional RSA and runway length was on either side of the existing runway using all of the existing land to minimize fill into Dutch Harbor and Unalaska Bay. However, as noted earlier, the FAA Flights Standards Division stated that it would not be possible to maintain the existing special approaches into DUT if the Runway 30 landing threshold were to be moved in either direction (due to worsening obstructions). Given these factors, only one declared distance alternative was determined to be operationally viable.

In this alternative, the end of pavement at the northwest (Runway 12 approach) end of the runway was to be extended by 200 feet to the northwest and the Runway 12 landing threshold was to be moved 200 feet to the northwest. The southeast (Runway 30 approach) end of the runway was to be extended to provide an additional 200 feet for RSA, and an additional 150 feet of separation from the road would be provided by including a smaller blast pad (150 feet as recommended for ARC B-II). Ballyhoo Road was to be rerouted around the end of the runway and new blast pad. The RSA pavement at each end of the runway would be displaced runway pavement and, as such, also be used by aircraft taking off, thus increasing the runway available for takeoff to 4,500 feet.

The practicability study projected the total costs for the declared distances alternative would be approximately $19 million to construct. The Runway 12 end costs were allocated into two 100-foot sections to differentiate between RSA and runway extension. The second 100-foot improvement for Runway 12 was considered an extension and was not included in the RSA costs. Therefore, the total RSA costs were estimated to be approximately $10.8 million.

An Engineered Material Arresting System (EMAS) was an FAA-approved aircraft arresting system intended for use where it is impractical to obtain standard RSAs, and other alternatives were not feasible. EMAS consisted of a bed of cellular concrete material blocks of strength appropriate for the types of aircraft expected to use the airport. The material will crush under the weight of an aircraft and bring it to a controlled stop in a very short distance. Located in the RSA area beyond the runway ends, EMAS was designed to stop aircraft that overrun the runway at exit speeds up to 70 knots. EMAS did not reduce the length of the RSA required for undershoots.

FAA Order 5200.9, *Financial Feasibility and Equivalency of Runway Safety Area Improvements and EMAS*, established the cost range for RSA financial feasibility. Both standard and non-standard system applications of EMAS were considered as part of the RSA practicability study; however, given that full RSAs could be provided within the overall runway footprint through declared distances, EMAS was not found to be practicable as it would increase the overall footprint and cost.

According to the report, after analyzing all options, the provision of full RSAs through the use of declared distances allowed DUT to meet the B-II standard at the lowest cost and was found to be the most practicable solution.

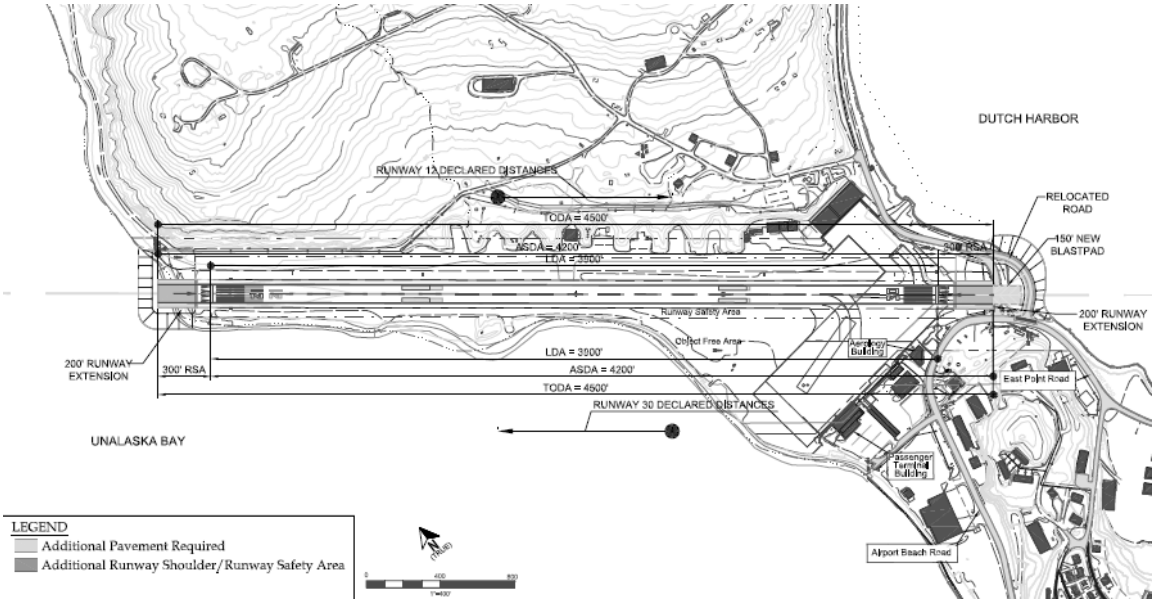

Figure 6. Modifications to DUT's RSAs and published distances obtained through the declared distances alternative.

5.5 DUT Airport Improvement Project 53443/AIP 3-02-0082-014-2012

The project was advertised for bid in 2012 and completed in 2016. The project included the following work:

- Construction of an embankment extending about 200 feet to the northwest, into Unalaska Bay
- Construction of an embankment extending about 200 feet to the southeast, into Dutch Harbor
- Separation of the runway from Ballyhoo Road by at least 150 feet by relocating the road onto the new southeast embankment extension
- Extension of the runway that was usable by arrivals by 100 feet to the northwest
- Extension of the runway that was usable for departures by an additional 300 feet in each direction by constructing runway over safety areas prior to thresholds
- Improvement of airfield drainage with shoulder and safety area regrading, along with culvert replacements at existing locations
- Relocation of FAA's visual approach aid at the northwesterly runway end due to the proposed shift in the threshold
- Relocation of utilities that crossed proposed aircraft operating area
- Repavement of the runway, including new extensions
- Repavement of taxiway/apron areas as needed to match proposed runway grade or utility relocations
- Replacement of airfield lighting system
- Redesignation of runway 12/30 to runway 13/31 upon completion of project

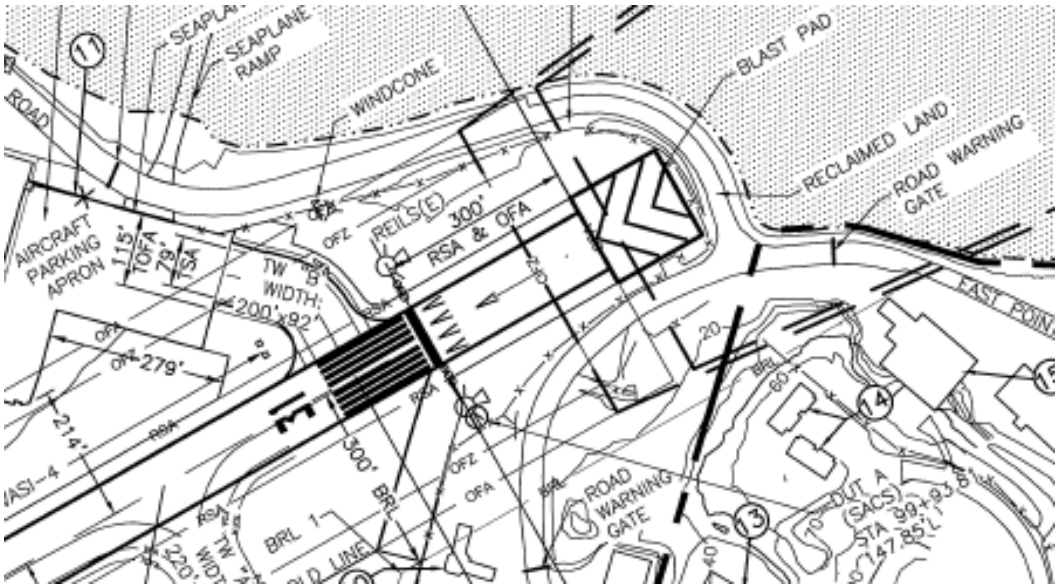

Figure 7. Post-construction view of the approach end of the runway 31 from DUT's Airport Layout Plan (ALP).

ADOT&PF provided a copy of DUT's current ALP which indicated that the post-construction views shown in figures 6 and 7 accurately depicted the pavement and RSA configuration at DUT on the day of the accident (see photo 13).

Photo 13. A postaccident view of the approach end of runway 31 showing the damaged perimeter fence and blast pad.

The ALP also included a diagram showing the airport's ultimate planned configuration. It was noted that the airport's ultimate configuration provided 600 feet of RSA at the Runway 31 approach end by adding additional fill into Dutch Harbor and relocating both Ballyhoo Road and the airport's perimeter fence (see figure 8). Similarly, the ultimate planned configuration showed 600 feet of RSA at the Runway 13 approach end that was obtained by adding additional fill to Unalaska Bay. According to ADOT&PF there was no timetable for the construction of the airport's ultimate configuration shown in the ALP.

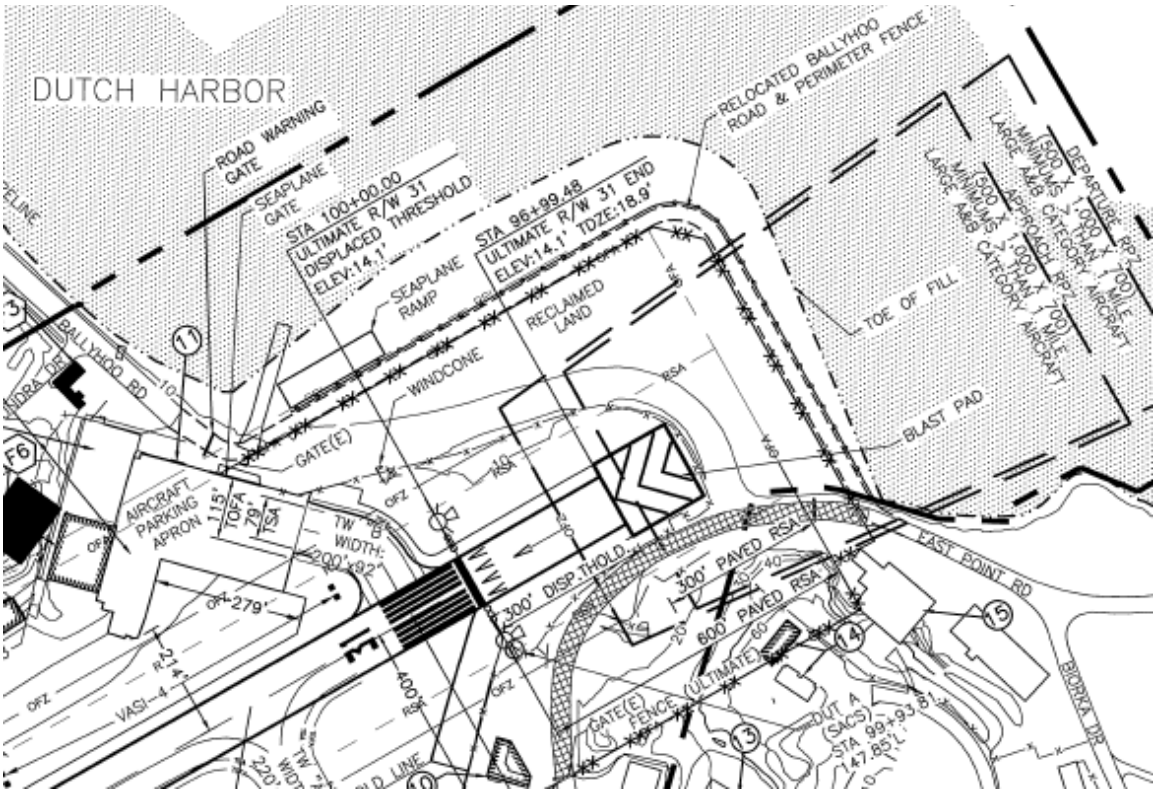

Figure 8. DUT's ultimate configuration ALP for the Runway 31 approach end.

In response to a series of NTSB questions to clarify the decision-making process involving the RSA construction process ADOT&PF stated that they had no role in the selection of aircraft that land at airports they own and operate – "we publish the airport information and the rest is between the carrier and the FAA." Further, "we don't dictate who or what airframe utilizes our airport system, that is between the carrier and the FAA."

ADOT&PF did not recall and could not find any documentation regarding PenAir's decision to fly the Saab 2000 in scheduled service at DUT but stated that "PenAir spoke about the desire to fly this airframe for a very long time." ADOT&PF added that "the community would like to have the Saab 2000 back in service. [ADOT&PF] has not taken a position or made any recommendations on airframes serving DUT. We only operate the airport."

5.6 Gate Procedures at DUT

DUT had three traffic control gates on Airport Beach Rd., Ballyhoo Rd., and East Point Rd. near the airport. According to ADOT&PF the gates could be lowered by approaching aircraft via the pilot-controlled lighting system (PCL) with 7 clicks on the frequency 122.6. Seven clicks also brought the lighting system to its highest intensity and turned on the runway end identifier lights (REIL). After the aircraft landed, 3 clicks were used to raise the gates, which was generally done while the airplane was taxiing. If the pilot forgot, the system's internally default raised the gates after 15 minutes.

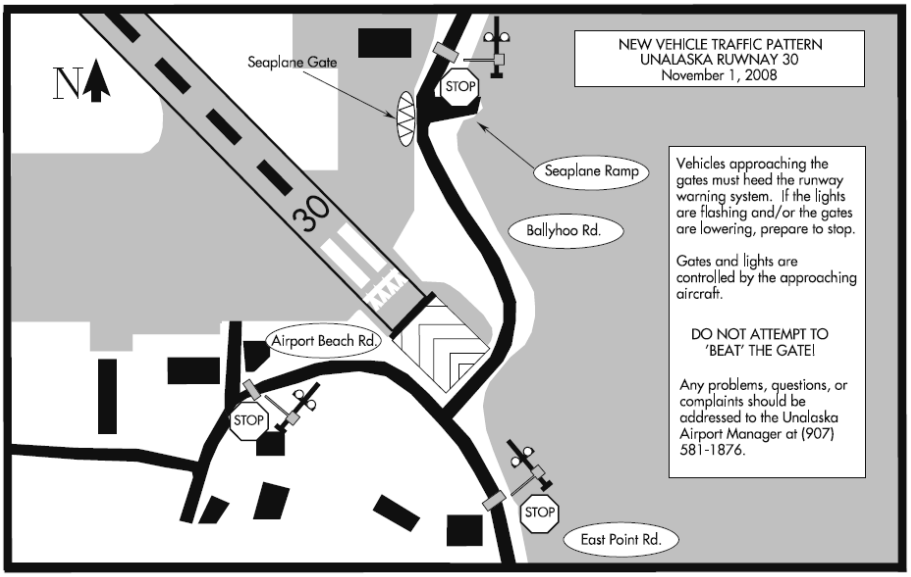

Figure 9. Locations of DUT's traffic control gates.

According to ADOT&PF, there had been some issues with the gates opening on their own when transmission traffic on 122.6 was broken up (usually when airplanes were on the other side of Mt. Ballyhoo) and interpreted by the system as 3 clicks. In response, the PenAir's vehicle (Mobile 1) was equipped with a garage-door-like remote opening system. Once lowered by the remote, the gate could only be raised by the remote. Mobile 1 was also equipped with an aircraft radio which could raise/lower the gates on 122.6.

During a November 2020 conference call with Corvus Airlines (Ravn Alaska)[8] personnel, the director of operations stated that the personnel operating Mobile 1 were all provided on-the-job training but that there was no written guidance other than what was provided about gate operation in the chart supplement. The chief pilot noted that, while the pilots had written guidance on what was needed to ensure the gates were closed prior to landing, it was not specifically detailed about who was supposed to open the gates after landing or when.

6.0 Emergency Response

6.1 DUT Aircraft Rescue and Firefighting (ARFF) Index

An Aircraft Rescue and Firefighting (ARFF) index was assigned to each FAA Part 139 certificate holder based on a combination of the air carrier aircraft length and the average number of daily departures. That index determined the required number of ARFF vehicles at the airport and required amount of extinguishing agents.

[8] On April 5th, 2020, Ravn Air Group filed Chapter 11 bankruptcy due to the Covid-19 pandemic. At this point, operations at all three certificates (Corvus Airlines, PenAir, and Hageland Aviation Services) ceased, and all employees were laid off. In July 2020, a sale of all company assets was announced. The assets of PenAir, and the assets and 100% of company stock of Corvus Airlines, were acquired by Float Alaska LLC. On October 15, 2020, the PenAir certificate was surrendered to the FAA. Float Alaska retained the rights to the PenAir name and its manuals.

Based on PenAir's service of DUT with a Saab 2000, the airport was assigned a Class A index. 14 *CFR* Part 139.315 required a Class A index airport to have one vehicle with either 500 pounds of sodium-based dry chemical, halon 1211, or clean agent; or 450 pounds of potassium-based dry chemical and water with a commensurate quantity of AFFF to total 100 gallons for simultaneous dry chemical and AFFF application.

DUT met this obligation with one E-1 Titan HPR 4x4-P501 ARFF unit. The vehicle had a capacity for 450 pounds of Purple K dry chemical and 1,585 gallons of water for foam production supplied by a 205 gallon foam concentrate tank. It was equipped with dual agent roof and bumper turrets, each which had a maximum flow rate of 750 gallons per minute. The vehicle was stored in an ARFF facility located adjacent to the large hangars directly across the runway from the terminal building.

6.2 Airport Response Summary

The only ADOT Airport Operations employee on duty at the time of the accident heard the PenAir airplane fly overhead on its missed approach and the pilot state over the radio that "he was going to get another look at it." On the second approach the accident airplane touched down and appeared to be going faster than normal. As it went by the airport operation's office he heard a boom that "sounded like a misfire." A short time later he turned around and looked up and saw the airplane off the runway and in the water. He immediately put on his firefighting gear and, while doing so, called 911. His call did not go through. He called a second time and got through and told them an airplane was in the water off the end of the runway.

He drove the ARFF vehicle to the accident site and called the airport manager while he was enroute. He arrived on the left side of the airplane and noted that passengers were evacuating out the right side of the airplane, but not the left. He positioned his vehicle to be able to react in case the left engine caught fire. A short time later he repositioned the vehicle to the other side of the airplane. He had someone on the ground help guide him around the airplane's tail. He noticed exposed wires to some of the lights and had someone shut off power to the runway. Other mutual aid emergency equipment began arriving and he backed out to allow an ambulance to get closer to the airplane. After an injured passenger was placed inside and the ambulance departed, he repositioned back to the same spot.

6.3 Mutual Aid Response

The airport's ACM included a mutual aid agreement with the City of Unalaska. Per the agreement, in addition to the airport response, Unalaska Fire Department (UFD) and Unalaska Police Department (UPD) units responded to the accident site.

Two off-airport security camera captured portions of the accident, evacuation and emergency response. Digital video files were provided to the NTSB by the Unalaska Police Department and are included as attachments 2 and 3. Review of the video files and computer-aided dispatch reports (also provided by UPD) allowed for the creation of the critical events emergency response timeline shown below.

Timeline

1740:29 – Airplane stopped moving
1740:40 – Right overwing exit opened (passengers begin exiting shortly thereafter)
1740:52 – Right rear door opened (evacuation through this door could not be observed)
1742:36 – End of initial passenger flow from right overwing exit
1742:42 – Airport ARFF vehicle arrived via Ballyhoo Rd.
1745:37 – First mutual aid fire vehicle arrived
1748:39 – First mutual aid fire truck to arrive
1750 – Medic 1 and Medic 2 arrived at scene
1754 – Radio traffic indicated one critical patient being extracted from airplane
1759 – Radio traffic indicated all occupants off airplane
1800 – Medic 1 enroute to medical clinic with critical patient
1802 – Medic 1 arrived at medical clinic
1854 – LifeMed (medevac flight) coming from Cold Bay; approx. 45-60 min ETA
1947 – LifeMed "wheels down" expected in about 5 minutes
2046 – Medic 1 departed clinic with patient for LifeMed
2053 – Medic 1 arrived at airport with patient for LifeMed

Jason Fedok
Survival Factors Investigator

Attachments

Attachment 1 – Injury Chart
Attachments 2 and 3 – Digital Video Files