

AVIATION OCCURRENCE REPORT

CABIN FIRE

**NORTHWEST AIRLINES
BOEING 727-200 N278US
MONTREAL INTERNATIONAL (DORVAL) AIRPORT, QUEBEC
28 NOVEMBER 1993**

REPORT NUMBER A93Q0242



The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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Synopsis

Immediately after push-back, a fire was noticed in an overhead stowage bin in the aft portion of the cabin. The fire was extinguished by the crew and the aircraft was evacuated. Some passengers sustained minor injuries.

The Board could not determine the cause of the fire; however, all evidence indicates that the fire was not accidental.

Ce rapport est également disponible en français.

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1.0 *Factual Information*

1.1 *History of the Flight*

On Sunday, 28 November 1993, Northwest Airlines flight 434 (NWA 434), a Boeing 727-200, was parked at gate 33 at the Montreal International (Dorval) Airport, Quebec. NWA 434 was scheduled for a 0700 eastern standard time¹ (EST)² departure for Detroit, Michigan (USA).

Boarding of the 60 passengers started at 0625 and was completed at 0645. Push-back, to position the aircraft parallel to the ramp and the terminal building, was initiated at 0647 and completed at 0650. After brake application by the crew prior to engine start, a flight attendant, who had just started the presentation of the aircraft safety measures, noticed smoke in the aft portion of the cabin.

The lead flight attendant entered the cockpit and advised the flight crew of a fire. Passengers had left their seats and were standing in the aisle. The captain, using the PA, requested that they remain calm and sit back down; however, they remained standing in the aisle. The second officer was sent to the back of the aircraft to evaluate the situation. When he reached the rear of the aircraft, where the two flight attendants were gathering fire-fighting equipment, he noticed smoke coming out of the overhead stowage bin

1 All times are EST (Coordinated Universal Time minus five hours) unless otherwise stated.

2 See Glossary for all abbreviations and acronyms.

above seats number 28 D, E and F. The second officer then lowered the aft stair and returned to the cockpit, through the standing passengers, to inform the captain and gather more fire-fighting equipment. While he was returning to the cockpit, flames appeared at the top of the door of

the overhead bin. One of the flight attendants donned a protective breathing equipment (PBE) smoke hood while the other flight attendant discharged a Halon fire extinguisher at the bin; the flames disappeared, but the smoke intensified and moved forward.

The second officer informed the captain of the situation; the first officer declared an emergency and requested the emergency equipment as the second officer returned to the back of the aircraft with a PBE and two fire extinguishers, one Halon and one CO₂. The Dorval tower supervisor activated the crash bell and the airport Rescue units proceeded towards the aircraft. Upon the commands of the captain, the lead flight attendant initiated the evacuation and the first officer informed ground control of their actions at approximately 0652:43. The first officer evacuated the aircraft via the right cockpit window as the captain went into the cabin to help the lead flight attendant with the evacuation of the passengers. The evacuation was carried out using the front left main door escape slide.

When the second officer arrived at the back of the aircraft, he opened the door of the bin. There were no flames, but there was still a glow and he discharged the Halon extinguisher on it after having donned the PBE. In the meantime, the two other flight attendants made sure that the passengers were all moving forward towards the exit. The second officer then went down the aft stairs and requested that the firemen enter the aircraft so he could show them the location of the fire. He then proceeded to the front of the aircraft where only the captain remained. They both evacuated the aircraft, via the slide, at approximately 0654.

The incident occurred at 0650, in the hours of darkness.

1.2 *Injuries to Persons*

| | Crew | Passengers | Others | Total |
|-------------|---------------|-----------------|---------------|-----------------|
| Fatal | - | - | - | - |
| Serious | - | - | - | - |
| Minor/ None | $\frac{6}{6}$ | $\frac{60}{60}$ | $\frac{-}{-}$ | $\frac{66}{66}$ |
| Total | $\frac{6}{6}$ | $\frac{60}{60}$ | $\frac{-}{-}$ | $\frac{66}{66}$ |

1.3 Damage to Aircraft

The aircraft sustained minor damage to the overhead bin and ceiling cover from the fire and smoke.

1.4 Personnel Information

1.4.1 Flight Crew

| | Pilot-in-command | First Officer | Second Officer |
|-------------------------------------|------------------|---------------|----------------|
| Age | 35 | 32 | 35 |
| Pilot Licence | ATPL | ATPL | ATPL |
| Medical Expiry Date | 05 May 94 | 01 Dec 94 | 01 Dec 94 |
| Total Flying Time | 12,000 hr | 7,600 hr | 7,700 hr |
| Total on Type | 5,000 hr | 3,000 hr | 3,500 hr |
| Total Last 90 Days | 50 hr | 220 hr | 225 hr |
| Total on Type Last 90 Days | 50 hr | 220 hr | 225 hr |
| Hours on Duty Prior to Occurrence | 1 hr | 1 hr | 1 hr |
| Hours off Duty Prior to Work Period | 14 hr | 14 hr | 14 hr |

The flight crew was certified and qualified for the flight in accordance with existing regulations.

1.4.2 Cabin Crew

The cabin crew was comprised of one lead flight attendant and two flight attendants. The cabin crew were qualified in accordance with the regulations for the flight. The number of cabin crew required by the regulations and the company procedures was three.

All cabin crew had completed annual training in the simulator. During the emergency, they generally had no problem using the emergency equipment, except for one flight attendant who had difficulties activating and donning the PBE.

1.5 Aircraft Information

| | |
|------------------------------|-----------------------------|
| Manufacturer | Boeing Aircraft |
| Type | 727-200 |
| Year of Manufacture | 18 Nov. 1975 |
| Serial Number | 21157 |
| Certificate of Airworthiness | Valid |
| Total Airframe Time | 44,966 hr |
| Engine Type (number of) | Pratt & Whitney JT8D-15 (3) |

| | |
|--------------------------------------|------------|
| Maximum Allowable Take-off Weight | 172,500 lb |
| Recommended Fuel Type(s) | Jet A |
| Fuel Type Used | Jet A |

The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

1.6 Meteorological Information

A low pressure system was covering the St. Lawrence valley. Low ceilings and visibilities were present. Light rain and fog accompanied by moderate winds were forecast for the whole period.

At 0700, there was an estimated ceiling of 2,100 feet with a visibility of three miles in rain and fog. The surface wind was from the east at 11 miles per hour (mph).

1.7 Communications

All the communications between Dorval Ground, NWA 434, and rescue police units were well established and were normal throughout the whole occurrence.

The flight crew and the cabin crew communicated solely by voice. Whenever information was passed on to the cockpit, the individual had to get to the cockpit to pass on the information. No intercom system was used during the whole incident sequence. For the evacuation, only voice commands were used.

1.8 Aerodrome Information

1.8.1 General

The Montreal International (Dorval) Airport is situated in the western portion of the island of Montreal. One portion of the airport is within the City of Dorval, while the other portion lies within the City of St-Laurent. Both cities have their own fire-

fighting facilities which will respond to emergency situations on the airport. The private group "Aéroports de Montréal" (ADM) operates the airport and has its own Emergency Response Services (ERS) located at the airport.

The cities of Dorval and St-Laurent are part of the Montreal Urban Community (MUC). The Montreal Urban Community Police Department (MUCPD) is responsible for the whole MUC and normally responds to emergency situations on the airport, where they have authority for criminal and other legal activities. The other police force represented at the airport is the Royal Canadian Mounted Police (RCMP), which assures the security of the airport and supports Customs and Immigration. Also, Urgences-Santé provide ambulances for the whole MUC area and is one of the initial respondents to an emergency at this airport. Urgences-Santé, the MUCPD, and the fire-fighting facilities of the adjoining cities normally respond to calls received through the 911 services.

The Dorval airport has three runways: runway 10/ 28 and the two parallel runways 06/ 24. The ERS building is located between the two parallel runways with direct access to their respective taxiways, Alpha and Bravo. Those two taxiways intersect the third runway, 10/ 28, and further on, the ramp area with its two terminal buildings which are all parallel to runway 10/ 28. There is no direct access from the ERS building to the ramp area. Another taxiway, Echo, joins taxiway Bravo to the ramp. (See Appendix A.)

NWA 434 pushed back from gate 33, which is located in the terminal building closest to and on the side of runway 10/ 28, and adjacent to the junction of the ramp and taxiway Echo.

1.8.2 Airport Emergency Response

When the crash bell was activated by the tower supervisor, the ERS personnel

proceeded to the ramp via taxiway Alpha. They reached NWA 434 within three minutes, which is the required response time. In the meantime, emergency measures were put into place by ADM through the airport duty manager, and other emergency respondents were requested through the 911 operator. The lack of information available to the 911 operator about the nature of the emergency and the operator's understanding of the situation resulted in delays--the response by the MUCPD, the City of Dorval firemen, and Urgences-Santé took approximately five minutes. When those parties arrived at the airport, the fire was extinguished, the evacuation was completed, and the situation was under the full control of the ERS personnel and the RCMP.

1.9 Flight Recorders

The cockpit voice recorder (CVR) was recovered and sent to the TSB Engineering Branch Laboratory for reading. The CVR was a Fairchild, Model A100A, with 30 minutes of recording time available. The electrical power remained on following the incident and the recording was not stopped. Therefore, all the information and communications regarding the incident were no longer available.

The flight data recorder (FDR) was not recovered.

1.10 Medical Information

Some of the passengers suffered from smoke inhalation but did not require hospitalization. During the initial portion of the evacuation, there was nobody at the bottom of the escape slide to steady the slide and assist the passengers by slowing them down. Most of those passengers suffered back stiffness in the days that followed this occurrence from the hard landing on the concrete ramp. Some of them reported requiring professional medical services to remedy the problem.

None of the crew reported any injury. There was no evidence that incapacitation, physiological, or psychological factors affected the crew's performance.

1.11 Fire

There was a fire in the overhead stowage bin at row 28 over seats D, E and F situated on the right side of the aircraft. Row 28 faces the aft galley. The fire was initially noticed during push-back by a flight attendant who was starting the demonstration of the aircraft safety features. The fire was successfully extinguished by the crew members with two Halon 1211 fire extinguishers. Shortly after, firemen emptied the contents of the bin and placed the items--a carry-on bag belonging to a flight attendant and five airline blankets made of 100 per cent polyester--on the floor of the aircraft. They then further saturated the items with a CO₂ extinguisher.

The carry-on bag, along with the majority of its contents, the blankets, and the entire stowage bin/ ceiling panel were delivered to the TSB Engineering Branch Laboratory to determine the source of ignition. The examination showed that the fire originated within the stowage bin but outside of the carry-on bag. The blankets were considered to have been the original source of fuel. The stowage bin did not contain any part of an aircraft system, such as electrical wiring, and no aircraft system and/ or failure of systems contributed to the ignition source.

There does not appear to be any accidental cause that would explain the ignition of the blankets. The charred products on the floor of the bin were examined for evidence of a match or cigarette and none was found.

A thorough inspection of the concerned portion of the aircraft was

carried out following this occurrence. There was no damage other than to the stowage bin. The same day, the aircraft was ferried to its home base in Minneapolis, Minnesota, where it was cleaned for a return to operations. During the cleaning of the aircraft, matches, which had been lit, were found in the handtowel dispensers of both aft lavatories. Burn marks on some handtowels were evident.

At present, there are no Federal Aviation Administration (FAA) flammability standards for passenger service blankets; however, the NWA blankets successfully passed an FAA "vertical" flame test required for cabin interior materials. The standard test of the American Society for Testing and Materials describes a "horizontal" test method for flammability of blankets. TSB Engineering Branch tests on the material revealed that, despite meeting the Federal Aviation Regulations (FAR) flammability standards for cabin interior materials, the NWA blanket material would readily support fire when folded flat.

1.12 Survival Aspects

1.12.1 The Evacuation

This B727-200 could carry up to 146 passengers. Sixty passengers were on board and were seated throughout the aircraft. The majority of the passengers sat by the wing area.

When the smoke started to spread within the cabin, some passengers left their seats and moved forward in the aisle. Upon the command of the captain, the lead flight attendant initiated the evacuation when he opened the left front door and the escape slide deployed automatically.

Even after being told to leave everything behind, the majority of the passengers took all or part of their hand baggage, which was then taken from them by the crew before they exited the aircraft.

The hand baggage was piled up in the forward galley against the right front door. This door, which could have been used as an exit, was not required for the evacuation.

The bottom of the escape slide was not steadied by "able bodies," as recommended by Northwest Airline's procedures, until the arrival of the ERS personnel. Approximately 50 per cent of the passengers exited the aircraft during that time and several landed hard on the concrete ramp.

The first officer, who had exited the aircraft through his side window, was at the front of the aircraft during the evacuation and directed the passengers towards the terminal building. Some passengers moved towards the grass area opposite the terminal building. This grass area borders the ramp, taxiway Echo, and runway 10/ 28. The crew of an aircraft taxiing towards the ramp on taxiway Echo reported passengers wandering around this intersection; the crew was requested to hold their position north of runway 10/ 28 until the area was cleared. Those passengers were eventually re-directed towards the terminal building by the ERS personnel and the RCMP officers.

During the whole emergency response and the evacuation, other aircraft movements continued. Those aircraft were either delayed or redirected on the central ramp area. Those movements did not, in this case, hamper the movements and response of emergency vehicles nor cause injury to wandering passengers.

The four overwing exits were not used, since the rapid displacement of the smoke and the passengers towards the front of the aircraft rendered this egress procedure unsuitable. The three aft exits were not used because of the presence of the fire and smoke in this area.

The Urgences-Santé personnel comforted some of the passengers after they had reached the terminal building.

1.12.2 Evacuation Training

The three cabin crew had completed their annual training. Northwest Airline does not conduct joint training of its flight crew and cabin crew for cabin emergencies and evacuation.

1.12.3 Aircraft Safety Features

The fire and evacuation occurred before the cabin crew had completed their presentation of the aircraft safety features, including the position of the exits.

1.12.4 Evacuation Commands

The crew used solely voice commands in the English language to give instructions for the evacuation. Some French-speaking passengers did not understand the commands, but they responded to the smoke and the movements/ actions of the other passengers.

1.13 Additional Information

1.13.1 Passenger Survey

None of the passengers were interviewed immediately following the incident. They were all re-scheduled on different flights within a few hours of the incident and they proceeded to their original destinations.

A 65-question questionnaire was sent to all the passengers. Thirty-five responded, for a response rate of 59.3 per cent. The response rate of this type of questionnaire is usually 15 to 20 per cent. Some of the passengers that responded were contacted to either clarify their responses or provide further information.

A survey of the response was conducted and some pertinent facts are

worth mentioning. Of the 35 passengers that responded:

- 29 were frequent flyers;
- 3 had counted the number of seat rows from their seat to the exits;
- 16 had read the card containing the aircraft safety features;
- 3 passengers indicated that they had difficulty understanding the English language;
- all 35 had their seat-belt fastened, and only one had difficulty releasing it;
- 30 inhaled smoke, and 16 of those suffered some discomfort;
- 23 took their carry-on baggage to the exit;
- 31 heard the voice commands shouted by the cabin crew;
- 10 mentioned that other passengers obstructed their path;
- 6 assisted another passenger;
- 7 required assistance, other than getting off the escape slide;
- 5 encountered some problem using the escape slide;
- 7 sustained minor injury using the escape slide, mainly from landing hard on the concrete ramp;
- 20 perceived there was a high level of risk or danger in this situation; estimates of the time for the evacuation varied widely; 13 passengers thought it was less than two minutes, while 16 thought it was up to six minutes. (The actual evacuation was completed within 90 seconds.)

1.13.2 Sequence of Events

The CVR did not contain information regarding the incident, and so was of no use in establishing the sequence of events. The times and conversations contained on the Air Traffic Services (ATS) tapes were therefore used in combination with information gathered from interviews to establish the sequence of events.

2.0 *Analysis*

2.1 *General*

The following analysis concentrates on the emergency response, the control of the fire, the evacuation, and the origin of the fire.

2.2 *Emergency Response*

The ERS responded within three minutes, as required, following the activation of the crash bell by the control tower supervisor. Although the fire had already been extinguished by the cabin and flight crew, the ERS personnel removed the contents of the overhead stowage bin and further saturated it with extinguishing agents. They also assisted in the evacuation by steadying the escape slide, slowing the descent of the passengers, and rounding up some of the passengers who had wandered onto the grass area.

The intervention of the Dorval firemen, the MUCPD and Urgences-Santé was delayed by the use of the 911 services, whose operator did not comprehend the nature of the emergency. Fortunately, this time, their intervention was not paramount to the success of the emergency response.

2.3 *Control of the Fire*

Two flight attendants initially responded to the presence of the smoke in the aft cabin. While they gathered fire-fighting equipment, the second officer opened the aft stairway to give a direct access route to the firemen. Following his departure towards the cockpit, flames which were not formerly visible emanated from the bin. The flight attendant then discharged a Halon fire extinguisher over the bin door.

The air moving into the aircraft from the aft stairway probably activated the fire and moved the smoke towards the front of the cabin. This, in turn, motivated the

passengers to leave their seats and move towards the front of the cabin.

The second officer and the ERS personnel further saturated the contents of the bin, thus minimizing the quantity of smoke and reducing the level of damage to the aircraft.

2.4 *The Evacuation*

The evacuation was started approximately 2 1/2 minutes after the smoke was initially noticed by the flight attendants. Within the next 90 seconds, all persons on board had evacuated the aircraft using only one exit/ escape slide. Only the first officer used another exit, his right side window.

The three aft exits were unusable due to their proximity to the fire and smoke. The four overwing exits were unsuitable for egress because of the rapid displacement of the smoke to this area and the movement of the passengers to the front of the aircraft. This left the two front doors as usable exits. The left front door was used successfully. The right exit could have been used only after removing the hand baggage which was piled up against it.

Since no able bodies were positioned, or requested, at the bottom of the escape slide until the arrival of the ERS personnel, the first passengers to evacuate landed hard on the concrete ramp. Several of those passengers suffered back and lower body soreness in the days following the incident.

Many passengers were disoriented upon exiting the aircraft. It was dark, rainy, and windy, and they were not familiar with the configuration of the airport. Until guidance was available, some passengers, in an attempt to move away rapidly from the aircraft, ventured towards the grass area, close to runway 10/ 28 and taxiway Echo where there was aircraft movement. Fortunately, the evacuation of the aircraft involved only 60 passengers, and all used

the same exit. Therefore, controlling and directing those 60 passengers while close to a terminal building was easily manageable and was rapidly under control.

2.5 *Origin of the Fire*

An extensive study of the overhead stowage bin and its contents clearly demonstrated that the source of ignition was outside the flight attendant's bag and was not an aircraft system.

The 100 per cent polyester blankets were the source of fuel for the fire. The TSB Engineering Branch study showed that the blankets could sustain a fire and that a match similar to the ones found in the aft lavatories could be a source of ignition.

Evidence indicates that the fire was not accidental. Circumstantial evidence such as the matches, which had been lit, found in the handtowel dispensers of the aft lavatories close to seat row 28, combined with the fact that a similar match could have been the source of ignition, and pertinent passenger statements, have prompted a separate investigation by the Arson Squad of the Montreal Urban Community Police Department to determine the source of ignition.

3.0 *Conclusions*

3.1 *Findings*

1. The flight and cabin crew was certified and qualified in accordance with existing regulations.
2. The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.
3. The ERS and RCMP personnel successfully responded and controlled the emergency situation; the other emergency respondents were delayed by the lack of information and understanding of the occurrence by the 911 operator.
4. Only one exit was used and required to evacuate all the passengers.
5. Some passengers sustained minor injuries during the evacuation.
6. No "able bodies" were requested to steady the bottom of the escape slide during the initial portion of the evacuation.
7. During and immediately following the evacuation, some passengers were reported wandering around taxiway Echo and runway 10/ 28, and had to be re-directed to the terminal.
8. The crew's response to the fire minimized damage to the aircraft.
9. The fire was contained within the overhead stowage bin.
10. The fuel source for the fire was polyester blankets.

11. No aircraft system acted as the ignition source of the fire.
12. Despite meeting the FAR flammability standards for cabin interior materials, the NWA passenger service blanket material supported fire when folded flat.

3.2 *Causes*

A fire developed in an overhead stowage bin during push-back. The cause of the fire could not be determined. All evidence indicates that the fire was not accidental.

4.0 *Safety Action*

4.1 *Action Taken*

4.1.1 *Joint Pilot/Cabin Crew Emergency Training*

Northwest Airlines has indicated that, beginning in January 1995, joint training for pilots and flight attendants will be conducted during annual recurrent training. The training will focus on communications between the flight deck and cabin, and will include in-flight fire scenarios.

4.1.2 *911 Communications During Airport Emergency Responses*

Subsequent to this occurrence, the Centre d'Urgence established a new method of operation. Specifically, 911 operators have received directions on the amount and type of information to be collected prior to initiating emergency responses to local airports.

4.1.3 *Unilingual Evacuation Instructions*

Although not required by regulation, most Canadian air carriers endeavour to provide safety briefings in both official languages. Also, some foreign carriers routinely ensure that bilingual flight attendants are on aircraft serving Quebec airports to provide bilingual safety briefings during these flights.

In July 1994, the TSB forwarded an Aviation Safety Advisory to Transport Canada (TC) highlighting the potential for delayed and/ or adverse reactions to unilingual emergency instructions by passengers who do not comprehend the language of instruction. In its response, TC indicated that, with the rewriting of the Canadian Aviation Regulations, safety briefings in both official languages will become a requirement under specified circumstances. Also, since the International

Civil Aviation Organization (ICAO) has no established standard regarding the language of safety announcements, TC will address this issue with ICAO.

4.2 *Action Required*

4.2.1 *Passenger Service Blanket Flammability*

Passenger service blankets are carried on most large air carrier aircraft and are usually stored in the overhead bins in the cabin. In addition to using the blankets for passenger comfort, several Canadian air carrier Flight Attendant Manuals instruct flight attendants to use the blankets for smothering flames on a person's clothing or seat. As demonstrated by this incident and in TSB tests, some passenger service blankets have adverse flammability characteristics even though the blanket material passed the flammability test prescribed for cabin interior materials.

In May 1994, the TSB forwarded an Aviation Safety Advisory to TC and the Cabin Safety Standards section of the FAA indicating that passenger service blankets should meet an appropriate flammability standard and that TC might wish to advise Canadian air carriers that passenger service blankets may present a fire hazard. In July 1994, using TSB information from this occurrence, the National Transportation Safety Board (NTSB) recommended that the FAA develop a fire performance test method and performance criteria (standard) for blankets supplied to commercial operators, then require those operators to use only those blankets that meet the standard (NTSB-A-94-131). At the same time, the NTSB also recommended that the Air Transport Association of America (ATA) warn association members about the flammability of blankets used for passenger comfort and urge members to replace these blankets with blankets containing more fire-resistant materials (NTSB-A-94-132).

In August 1994, the ATA response to the NTSB recommendation indicated that

ATA had advised its members about the flammability of passenger service blankets. In January 1995, in response to the TSB Advisory, TC indicated that they would be reviewing the issue of blanket and pillow flammability with the FAA via an international working group and that it would be premature to advise carriers of the potential fire hazard prior to the completion of the working group's activities.

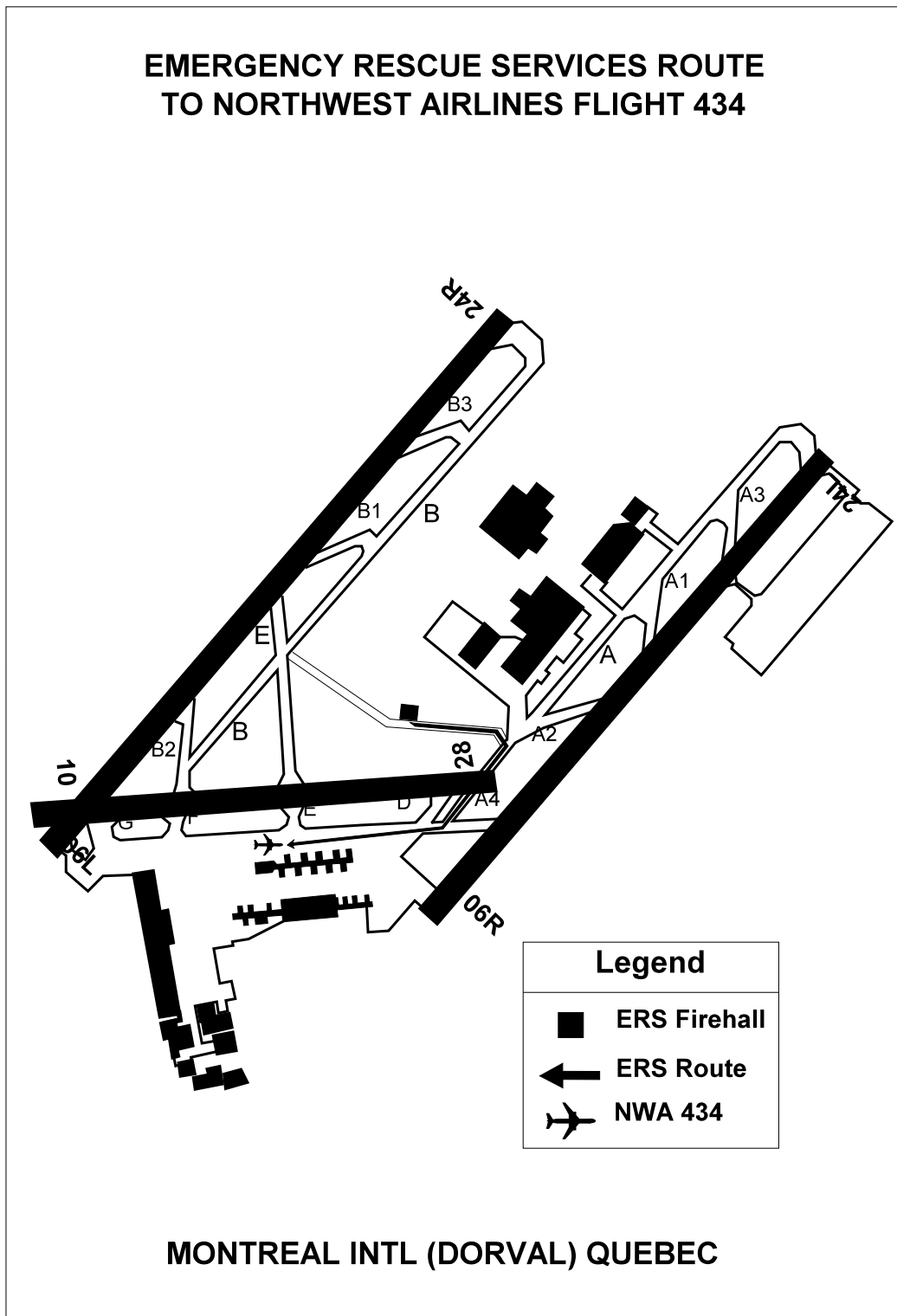
The Board understands that the international working group is considering issues such as types of fabric and flammability protection processes, effects of in-service use, and appropriateness of flammability standards. It is recognized that it may not be practical to disseminate information on these issues until discussed by the working group. However, considering how easily the folded blankets ignited and developed a molten polyester pool fire in both the occurrence and post-incident test, Canadian air carriers may wish to take interim measures based on their assessment of the hazard. Therefore, the Board recommends that:

The Department of Transport immediately advise Canadian air carriers about the potential flammability of some passenger service blankets.

A95-14

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson, John W. Stants, and members Gerald E. Bennett, Zita Brunet, the Hon. Wilfred R. DuPont and Hugh MacNeil, authorized the release of this report on 28 February 1995.

Appendix A



Appendix B - List of Supporting Reports

The following TSB Engineering Branch Laboratory reports were completed:

LP 154/ 93 - Fire Source Analysis; and
LP 156/ 93 - CVR Playback.

These reports are available upon request from the Transportation Safety Board of Canada.

Appendix C - Glossary

| | |
|-------|--|
| ADM | Aéroports de Montréal |
| ATA | Air Transport Association of America |
| ATPL | Airline Transport Pilot Licence |
| ATS | Air Traffic Services |
| CVR | cockpit voice recorder |
| ERS | Emergency Response Services |
| EST | eastern standard time |
| FAA | Federal Aviation Administration |
| FDR | flight data recorder |
| hr | hour(s) |
| ICAO | International Civil Aviation Organization |
| lb | pound(s) |
| mph | miles per hour |
| MUC | Montreal Urban Community |
| MUCPD | Montreal Urban Community Police Department |
| NTSB | National Transportation Safety Board |
| NWA | Northwest Airlines |
| PBE | personal breathing equipment |
| RCMP | Royal Canadian Mounted Police |
| TC | Transport Canada |
| TSB | Transportation Safety Board of Canada |
| USA | United States of America |