Canadian Airlines

Canadian Airlines International continues to incorporate into its business practices, the critical significance of timely, uninhibited and accurate communication between the entire air crew team. This paper will describe the establishment and ongoing development of **Standard Operating Procedures** (SOPs) and training in the area of crewmember (Flight Deck & Cabin Personnel) communication and coordination in normal, abnormal and emergency situations. Related occurrences, including a hull loss, have resulted in continued internal operational review, training and aircraft system modifications to facilitate the processes.

The design of this paper would not have been possible without the technical support of Mr. Gord Petri, Manager, Flight Operations Support and Ms. Christine Holliday, Inflight Safety Standards Manager. Ms Holliday is dedicated to "day of operations" oversight and also directs Standard Operating Procedures design and implementation.

Canadian Airlines International operates a fleet of 85 aircraft including the Boeing 747-400, B767-300ER, DC10-30ER, A320-200 and B737-200/C. Multi-cultural Flight Crew is comprised of approximately fifteen hundred pilots and thirty-one hundred cabin personnel. Current system expansion will see the introduction of approximately two hundred new pilots, three hundred cabin personnel as well as the addition of four new B767-300ER and one A320-200 aircraft.

A rich history includes the conclusion of the amalgamation in 1990, of five founding airlines to form the present system (Canadian Pacific Airlines (CP Air), Pacific Western Airlines, Nordair, Eastern Provincial Airlines and Wardair) The integration of five similar yet distinctive employee work cultures, each with their own visions, values and operational philosophies presented considerable challenges in terms of establishing consistent platform terminologys. The subsequent applications in crew communication and coordination in normal, abnormal and emergency conditions was initially addressed through convergence training and line support / feedback. It continues to be maintained as a priority in procedural design, training, optimal performance coaching / feedback and In-Flight Safety Event Investigations.

A Corporate Priority

The priority for safe flight operations and employee safety is an essential corporate value fully supported at the President and Senior Executive levels. It is recognized as the fundamental premise to the overall success and future of the organization. The priority is also an integral component to the company's mission statement and individual departmental business objectives.

The company is proud of its outstanding safety record, which is maintained through the focused collective efforts and initiatives of front line operational personnel. Encouraging and supporting these efforts is a highly skilled and competent network of internal and external resources and services.

Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs

Collaborative and consultative research and development are key to continued sustainability. Air Operators, Labor Groups, Regulators, Associations, Manufacturers and Suppliers all play a critical role as members of the international aviation community.

The Communication Philosophy

Timely, uninhibited and accurate communications between the entire air crew team is an ongoing orchestration. It must be exemplified, taught, practiced and supported consistently in normal operations to ensure consistent application, where it is most critical, in abnormal and emergency / crisis communication conditions.

Fundamental Communication Priorities & Concepts

The fundamental communication priorities and concepts must be corporately endorsed from the top levels. To be sustainable, they must be established, supported and encouraged during Initial training and jointly practiced amongst the entire operational team on an ongoing basis. This forms the core key principal of Canadian's ongoing research and development of systems, processes / procedures, equipment and training products.

The award winning Air Crew training environment promotes open dialogue, healthy challenges and an emphasis on "application level" (hands-on) exercises particularly in annual combined "Pilot and Cabin Personnel" programs. Accelerated learning techniques, actual case studies, drill scenarios, LOFT (Line Oriented Flight Training) and Crew Resource Management (CRM) concepts are standard developmental features.

A majority of the initiatives undertaken to this goal are reflective of a consultative approach to design. Crewmembers and all personnel are encouraged to fully participate and continuously provide input and feedback. Numerous procedural enhancements have been installed as a direct result of recommendations made by crewmembers, especially those that have been involved in occurrences.

A signal to the commitment is the In-Flight department access to a dedicated and accredited **Communications Specialist** (Theresa Rath) . Theresa has established communication protocols, which have been validated through surveys of operational personnel. In fact, she is part of a network of specialists strategically positioned in all operational departments. Timely and powerful Communication Plan designs and implementation schemes are amongst her multi-tasked priorities.

The lessons have been learned to keep terminologys and general communicative processes as simplistic as possible. Common Terminologys, consistent technical publications, (Manuals & Information Circulars), Checklists and Placards all form essential ingredients to this outcome. This is of particular significance, in operations such as Canadian Airlines, where cabin personnel are qualified on up to five different aircraft types.

Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs

Canadi➤n Airlines

Non Verbal Communications – Application of Code Words & Color Codes – Conditioned Responses

Much success has been derived from the incorporation of "code words" and required responses into Standard Operating Procedures. For example:

To alert all other cabin personnel of a cabin fire situation, the "primary firefighter" (first crewmember to discover the fire) or backup will announce over the PA system, *"Safety Unit to… (Area   )*.   This alerts other crewmembers to initiate established fire-fighting protocols such as, obtaining back-up equipment, establishing and maintaining communication with the flight deck, passenger control etc.

The procedure was recommended by a line Flight Attendant and drawn from the Hospital practice where codes are in regular use.

To alert Flight Attendants of a declared emergency, the flight deck will announce over the PA, *"CSD to the Flight Deck", " CSD to the Flight Deck."* This signals the CSD (Customer Service Director (In-Charge Flight Attendant), to obtain the Captain / CSD Briefing Checklist and immediately establish flight deck communication either in person or via interphone. To all Flight Attendants, it signals the priority need to obtain their Cabin Duties Checklist; begin preliminary cabin secure duties; and to anticipate a briefing by the CSD.

To alert all Flight Attendants of an emergency briefing by the CSD (Customer Service Director (In-Charge Flight Attendant), the CSD will announce over the PA*, "Flight Attendants stand by for interphone call"*. Flight Attendants assigned positions with interphone handsets will pick up the handsets and listen to the briefing. Flight Attendants without handsets will report to the CSD station for briefing.

Other Code Word applications include the key phrases announced over the PA by the flight deck crew:

Signal	Indicates
"Emergency Stations" (repeated twice)	Approximately 2 minutes to impact; Conclude duties, enroute to jumpseat
"Brace for Impact" (repeated twice)	Approximately 30 seconds to impact; Initiate Brace shouted commands
"Evacuate" (repeated twice)	Commence evacuation

Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs

A variation of this code is practiced for normal door arming and disarming to reduce the risk of inadvertent slide deployment. The CSD will announce over the PA *"Ladies and Gentlemen we have closed the main entry door, Flight Attendants stand by your doors."* This alerts flight attendants to impending departure, to discontinue all activities not related to safety and to stand by and verify the status (Armed / Disarmed) of their assigned exit. After allowing time for Flight Attendants to react the CSD will follow up by stating, *"Flight Attendants (Arm / Disarm) your doors for (departure/ arrival) and cross – check".* The process is concluded by the CSD completing a "Door Verification" call where by exits are sequentially stated during a conference call with each position confirming the door mode.

Rapid Deplanement is used when a situation arises at the bridge (jetway) /ramp which requires all passengers and crew to leave the aircraft quickly for safety reasons but does not require an evacuation using exit slides. The Captain will make a PA announcement directing the passengers and crew to leave all their personal belongings behind and leave the aircraft quickly via the entry door.

Cabin Personnel will follow the Captain's instructions with the flight attendant closest to the entry door(s) leading the passengers into the terminal. Flight Attendants leading the passengers into the terminal will advise ground staff of the situation. A final check of the cabin will be made to ensure all passengers are off the aircraft prior to the remaining flight attendants vacating the cabin. The CSD will report to the Captain all passengers are off the aircraft before leaving themselves.

Landing Classifications

Three levels of landing classifications have been adopted by Flight Operations and Inflight Services and have been successful applied to several events.

The following terminology will be used when briefing the CSD to describe the type of landing and emergency procedures (if any) to be followed.

The decision on which classification to use rests with the Captain.

<u>**Normal Landing**</u> – Indicates a **NORMAL**, uneventful landing is expected. – NO EMERGENCY preparations are necessary

<u>**Abnormal Landing**</u> – Indicates a condition exists which requires a **"high alert"** level.
The Cabin Crew remains ready for possible emergency situation by completing "Silent Reviews", being alert to all PA announcements and being ready to **EVACUATE** upon the **Captain's COMMAND**. Passengers need not be briefed.

<u>**EMERGENCY Landing**</u> – Indicates a **serious situation exists** which requires **Cabin Personnel to follow all Emergency Procedures under the Captain's direction.** Passengers should be fully briefed.

Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs

Canadi➤n Airlines

Putting the Passenger on the Team

Procedures are now in place which mandate any safety concern expressed to a Flight Attendant by a passenger, or the concern of a Flight Attendant to be reported to the Captain immediately. Before take-off passenger briefing announcements include*, "If you have any safety concern during the flight, please do not hesitate to bring it to the attention of a crew member."*

Cabin Personnel are guided that unless an emergency situation exists, no contact with the flight deck is to be initiated during *Critical Phases* of flight. Critical Phases of flight have been defined and published as being:

"A time frame including all ground operations when the aircraft is in motion, the first and last ten minutes of flight and all other flight operations conducted below 10,000 feet where, historically, incidents are most likely to occur."

Color Code Applications

This non verbal form of communication has proven to be of enhanced value to SOP compliance and is readily identifiable by the entire multi-cultural employee group.

Following detailed research, investigation and cabin personnel consultation into a pattern of inadvertent slide deployments, particularly on gate arrivals, a consistent fleet color code model was applied to all aircraft types. Using the basic model Red – **STOP**; Yellow – **CAUTION**; AND Green – **GO** (Normal).

- All door placards were increased in size and standardized
- All **DISARMED** placards are **GREEN**
- All pin/streamer slide arming lever "lock pins" (Disarmed Only) - **GREEN**
- All **ARMED** placards are **RED**
- All Floor Level Girt Bar Lock Down Indicators are **RED**
- All Slide Arming Levers are **YELLOW**

The color code concept has also been successfully applied to cabin personnel Emergency Passenger Briefing Checklists and are easily identified.

- CSD (In-Charge) Flight Attendant Captain/ CSD Briefing Checklist – **BLUE**
- Cabin Duties Checklists – **GOLDENROD**
- Anticipated – Long Preparation Briefing Announcement – **PINK**
- Boxed information included when applied to Water Evacuation scenario
- SNEL – Short Notice Emergency Landing Briefing Announcement - **GREEN**

Checklists and Announcement Booklets have been conveniently installed at the CSD and language qualified Flight Attendant stations at the suggestion of line personnel.

Kevin V. Bradley
                              Manager, Cabin Safety & Regulatory Affairs

Lessons Learned – A Case in Review

Many of the lessons learned and ongoing refinement of crisis / emergency communication procedures result from the findings and recommendations of actual occurrences. Such is the case in the following profile. After a brief introduction of the case, bullet point findings and recommendations **(bold)**, are followed by descriptions of the resulting procedural enhancements and implementations.

The case is used as a platform event throughout this paper, but should not be concluded to be the exclusive driver to the procedural implementations and enhancements described.

On March 22, 1984 at 1427Z aircraft 745 (Pacific Western Airlines B737-200) caught fire during the takeoff roll at Calgary International Airport. The aircraft was designated as Flight **PW501**, with 114 passengers and 5 crewmembers on board.

The takeoff had been commenced on runway 34 from the intersection of taxiway Charlie 1. At approximately 70 kts., a loud bang was heard and the aircraft veered slightly to the left. The Captain assumed this was the result of a blown tire. He aborted the takeoff and brought the aircraft to a stop on taxiway Charlie 4.

The loud bang had, in fact, been caused by a failure of the # 1 engine 13th stage compressor disc. A segment approximately 15 percent in circumference had exited through the engine cowling and punched a hole in the lower wing surface. Fuel escaping from this hole ignited immediately and a major fire developed. All 114 passengers and 5 crewmembers were successfully evacuated but the aircraft was destroyed in the ensuing fire.

The passengers consisted of mainly business men and women. Most were regular route travelers and familiar with the Boeing 737. They required little or no direction during the evacuation. This dynamic certainly contributed to its success.

Time from the event until the evacuation took place was between 1 minute and 55 seconds to 2 minutes. Time to complete the evacuation was approximately 2 minutes.

Findings, Recommendations & Responses

A cross section of some of the findings, recommendations and procedural implementations resulting from **PW 501** as well as other system events and accident investigations are described below.

- **It can be concluded that the cause of the accident was due to a failure of the #1 engine 13th stage compressor disc.**

Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs

PW501 - As he lined up on runway 34, the Captain, who was to fly the first leg, advanced the thrust levers, checked that the engine thrust was stable, then pushed the levers up to the takeoff setting of 2.04 EPR.

At approximately 70 kts., he heard a loud bang and the aircraft veered slightly to the left. The Captain initiated a reject thinking this was the result of a blown tire. The aircraft had accelerated approximately 1300 feet down the runway. From the control tower the # 1 engine appeared to explode and fire was immediately visible. The VFR supervisor who had been watching the departure from the ATC assistant's position started to ring the Firehall immediately after the flash was seen. Almost simultaneously with the bang, a male passenger sitting in seat 16A looked out the window and said "look at the flames."

- **The Flight Attendant at the rear of the aircraft, who was the first crewmember to see the fire was unable to contact either the Captain or the Purser using the interphone system.**
  - **The chime system proved to be inadequate in this case.**
    - **The chimes were not readily heard and the light in the cockpit is somewhat out of view**
      - **Ideally a separate system for emergency use only should be installed. Such a system should provide distinct audio and visual signals in the cockpit and at both flight attendant stations.**

PW501 - As the aircraft had slowed down and turned off Charlie 4 the # 2 Flight Attendant had looked out the small window in the service door but did not see anything unusual. When he heard the commotion in the cabin he yelled "grab ankles, stay down". He got out of his seat, went into the cabin and saw an orange glow around the left engine. He assumed the pilots would be fighting the fire with the integral extinguishing system. As the glow continued to grow he returned to the rear service panel and rang the flight deck. He got no response when he rang the Captain on the interphone. He tried to ring the Purser and got no response either so he rang both positions alternately.

About this time a passenger got out of his seat and started to run up the aisle, and about two others started to get up. A deadheading Captain yelled at them to sit down. The running passenger stopped, turned around and said "but the aircraft is on fire." The deadheading Captain yelled at him again to sit down and he did.

Passengers sitting on the left-hand side at the back were becoming very agitated, as the fire was now very apparent. The deadheading Captain got up, went to the back and suggested to the #2 Flight Attendant that he call the Captain as he was sure he was not aware of the fire. The #2 Flight Attendant informed him he had been trying but no one would answer. The aircraft was still rolling. The #2 Flight Attendant saw the rear windows begin to melt. The #2 Flight Attendant attempted to call the Purser again.

**Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs**

The Purser went back into the cabin and answered the interphone and heard the #2 Flight Attendant say "We're on fire". She did not acknowledge his comment, therefore he did not think anyone had heard him.

Open Interphone – Aircraft System Modifications

A B737-200/C fleet modification was installed by Maintenance & Engineering and procedures were implemented. The system establishes instant communication between the cabin and the flight deck from the final notification for takeoff (three chime signal) until after the aircraft is in a stable climb configuration (wheels / flaps retracted). The cabin interphone system is routed directly into the Pilot's headsets. The system is also activated from the final notification for landing until the aircraft is off of the active runway.

Flight Deck and Cabin Personnel abnormal and emergency communications procedures were established to facilitate the link and incorporated into the Flight Attendant Safety Handbook, Flight Operations Manual and training programs. The procedures simply require the Flight Attendant to pick up the handset, state their position in the cabin and state the problem and they are heard by the Pilots.

To date, it has been used by Cabin Personnel on several occasions and has fulfilled its designed intent of enabling the Pilot-In-Command to make the most informed command decisions. In one event, the "Open Interphone" system established instant emergency communication from the aft Flight Attendant station to the flight deck and assisted the Captain in reaching the decision to rejected the take off. The 2L door (airstair) of a B737-200C, which had not been properly verified as "locked", began to open and the airstairs began to deploy during the takeoff roll. In another event, the 4R Flight Attendant successfully advised the flight deck that the (DC10) door had unlocked and moved slightly inboard immediately prior to touch down on the runway in Honolulu Hawaii.

The **Open Interphone** concept was later applied to the B767-300ER. All other aircraft types in the fleet have dedicated audio and visual emergency communication system designs that clearly differentiate normal from emergency communications between the flight deck and the cabin.

Additional Communicative (Linguistics) Considerations

Canada's two official languages are English and French. Canadian Aviation Regulations require all safety-related announcements to be delivered in both languages. In addition, Canadian Airlines Standard Operating Procedures require that all announcements also include translation into the prominent route language(s).

Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs

Abnormal / Emergency Communications during Cruise Phases

To overcome timely emergency communication needs during cruise flight phases, an additional modification was installed in the flight deck on the B737-200/C aircraft and again procedures were established and incorporated into manuals and training.

Subsequent events have validated the need to fine-tune this further. The previous single tone chime and corresponding light on the B737 flight deck made it difficult for the pilots to respond promptly and consistently. The modification and procedural changes enable the Flight Attendant to "Push and Hold the Captain switch for six to eight seconds". In the flight deck, after three seconds, a medium pitch warning horn sounds automatically and continuously until the button is released by the flight attendant. The "call" light then remains illuminated for a further ten seconds as indications of the urgent nature of the call.

Consistent Standard Operating Procedures have been subsequently customized and applied to all aircraft types and are practiced during drills in Initial, HFST (Human Factors & Safety Training (Recurrent, includes joint Pilot/ Cabin Personnel) ReQualification and Initial Aircraft Type Cabin Personnel / Pilot training programs.

- **The control tower did not provide the needed factual information in a timely fashion.**

PW501 – The fire warning bell sounded very briefly and the Captain apparently cancelled it. The Purser repeated that the fire was on the back of the wing on the left side. The First Officer called the control tower and asked if they could see any fire around the left wing. The control tower reported some fire on the back around the left engine but that it was starting to diminish. The Purser again told the Captain the left-hand side; the whole back side of it is burning.

The First Officer advised the control tower that they had no fire indication but to send the emergency equipment. The # 2 Flight Attendant was alternately ringing the Captain and the Purser.

The control tower advised Flight 501 that the trucks were on the way and suggested 501 taxi towards taxiway Juliet as the fire trucks would be coming that way. This again took away from the urgency of the situation. The control tower advised Flight 501 the fire trucks were on the way but 501 did not acknowledge.
The first Officer told the control tower they would try Juliet. The control tower withdrew the previous suggestion and suggested Flight 501 stop where they were. The First Officer advised the control tower that 501 was stopping and that they could see the trucks on the way.

The control tower acknowledged Flight 501 was stopping and advised them that a bit of flame was going up the left side.

9

The Purser went back into the flight deck and told the Captain it was getting really bad at the back. The Purser remembered the fire bells ringing and believes she saw the Captain activate the fire switch. The #2 Flight Attendant saw the rear windows begin to melt.

It was when the Purser came back up the second time and told the Captain it was getting bad at the back that the Captain made the decision to get the passengers out. The #1 engine fire warning bell came on and stayed on as the fire had burned through the engine cowling from the outside (the fire warning system is designed to detect fires inside the engine cowling).

The Captain and first Officer then completed the "Engine fire, on Ground Check" and the evacuation commenced. The time from when the Captain first received advice of fire until the evacuation was called was just under one minute. The "Engine Fire, on Ground Check" which is to be completed after an engine fire warning indication calls for firing both extinguisher bottles if necessary.

- **The aircraft was not brought to a full stop soon enough.**

  - **If the Captain had made a visual inspection, by opening the cockpit window and looking out, the seriousness of the situation would have been immediately apparent to him.**
    - **After an aborted take off for a suspected tire failure, suspected engine damage, or damage of any kind the aircraft should be brought to a full stop and situation assessed prior to further taxi. When practical, a visual check should be made. (If this had been done, the evacuation would have started a full minute earlier).**

The Purser and the #3 Flight Attendant got out of their seats and saw the activity of the passengers at the rear and the glow on the left side. The Purser knocked on the flight deck door and waited. She walked back into the cabin a few rows, looked towards the back then turned and went back to the flight deck. She knocked again and the door was unlocked.

As the aircraft slowed down, fire was visible from the control tower and to the passengers in the rear but there was as yet no fire warning indication in the cockpit. The control tower made no mention of fire at this point. When the Purser entered the cockpit, she asked the Captain, "did we blow a tire?" This question took away some of the urgency from what she told him next, that there was some fire at the back. The loud bang, the veer to the left and the vibration had convinced the Flight Crew they had a tire failure. This new information of fire at the back was vague, at first difficult to accept and took the Captain by surprise. There had been no indication in the cockpit. Was there a brake fire? Could it be hydraulic fluid vaporizing on hot brakes? Perhaps they had thrown a tire tread and it had damaged a hydraulic line. The Captain queried the Purser as to the extent and location of the fire.

**Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs**

In the cabin the #3 Flight Attendant made an announcement asking the passengers to remain seated and to stay calm.

The #3 Flight Attendant remained in the forward galley area. The passengers forward of the overwing exits remained relatively calm as the fire was not visible to them. The Passengers on the right side from the overwing to the rear were apprehensive as they could see the glow. The passengers on the left side from the overwing to the rear were subjected to the greatest level of fear for their lives. They could see the fire was growing. The aircraft was still moving forward slowly.

Crewmember Coordination & Communication – Rejected Take-Off

Subsequent to this event and factoring in other related events, Cabin Personnel SOPs have evolved to reflect specific protocols for "Rejected Take-Off ", that require them to remained seated and fully secured while the aircraft is still moving. When the aircraft is off of the active runway, they are to remain seated and follow the Captain's instructions. When the aircraft stops or turns off the active runway, if Cabin Personnel notice an emergency situation developing, if necessary, they can get out of their jumpseats to assess further, any conditions and/or passenger reactions. If their assessment reclassifies the situation as a possible emergency they are to contact the flight deck immediately (using established emergency signal – Open Interphone B767/ B737, state their position and state the nature of the problem).

- **Although it was intended, no specific direction to evacuate was given.**

PW 501 - The Captain again gave the command to the Purser "Prepare for emergency Evacuation". The Purser went back into the cabin and via the interphone informed the #2 Flight Attendant to "Prepare to Evacuate". The #3 Flight Attendant received the command verbally. A male passenger was attempting to open the right-hand overwing exit at this point.

The two right main doors and the right-hand overwing exit were opened almost simultaneously. When the Purser opened the right-hand forward door she had some difficulty due to the drag of the slide. She remembered her ears popping from the loss of aircraft pressurization about the time she opened the door. The #2 Flight Attendant opened the right rear service door and appraised the situation. Although smoke would come in this exit, he decided to use it as long as possible. The #3 Flight Attendant opened the left forward cabin door. A male passenger opened the right overwing exit holding it momentarily, until other passengers around him told him to throw it out on the wing.

At this point thick dense smoke started to fill the cabin from the rear. From the center of the cabin forward was still clear. The sound of the #2 engine spooling down was heard by the first passengers exiting out over the wing. As soon as the forward doors were opened, passengers began evacuating with no direction needed.

Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs

It is assumed that the passengers were required to evacuate faster at the rear of the aircraft as a result of the obvious need. As they were hampered by low visibility they had to resort to a "follow the leader" type lineup, slowing the evacuation somewhat.

The #2 Flight Attendant performed his entire evacuation in heavy smoke and had to keep sticking his head outside the door for air. He assisted people off with commands and physically pushed them to the door. Both the Purser and the #3 Flight Attendant remembered passengers carrying off luggage.

The area where the most panic was exhibited was at the overwing exits where passengers were jumping over seats and some pushing and shoving occurred.

The Purser evacuated through the right front door (1R). The #3 Flight Attendant crouched down in the smoke and went back into the cabin to approximately row 9 where he could see about three passengers lined up at the overwing area. The #2 Flight Attendant had no more passengers at the rear exit. He went into the galley and cabin entry area a tried to feel for passengers in the dense smoke. He found no one, and so he exited out of the right rear door (2R). He recollected getting off the slide and turning to see it start to go up in flames. The #3 Flight Attendant went back up the cabin aisle and exited out the forward service door (1R).

The two pilots upon entering the cabin were shocked at the amount of smoke. It seemed like a solid wall of smoke at the cabin windscreen. They had expected to be able to look right down the airplane but could not see the first row. They exited the airplane through the right-hand forward door (1R).

The wreckage was resting on the nose gear, the right main gear and the #1 engine. The landing gear support structure on the left side had melted causing the gear leg to bend backwards and the aircraft to settle on the #1 engine. The tail section rested on the ground and the top of the fuselage was burned right through from the trailing edge of the wing to the back galley area. The tail section was being held in place by wiring and steel tubing that runs through the cabin floor.

Responsibility & Authority to Initiate Evacuation – Cabin Personnel

In this regard, following PW 501 and other related events, Cabin Personnel SOPs have been enhanced to include specific responsibilities and conditions under which evacuations are to be initiated. Primarily, whenever instructed to do so by the flight deck and an evacuation signal system, where applicable. Also they have the responsibility and authority to initiate an evacuation when four conditions combine:

There is an obvious need (fuselage breakup, fire/smoke, aircraft attitude etc.);
The aircraft is stopped;
The engines are shut down; and
They have attempted communication with the flight deck

Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs

Standard Operating Procedure (SOP) Implementation – Rapid Deplanement

Following several on ground events including false APU (Auxiliary Power Unit) fire warning indications, PTI (Positive Target Identification – Bomb Threat), and fuel spills, the need was recognized to design a procedure to facilitate getting all occupants off of the aircraft quickly. This, without subjecting the occupants to the inherent injury probabilities of using evacuation slides.

The procedure has been successfully applied a number of times and again demonstrates the enhanced safety benefits of incorporating processes linked to a code word or terminology which is immediately recognized and implemented by crew members. When cabin personnel hear the flight deck instruct "Rapid Deplanement" or their professional judgement deems it appropriate, they can react immediately with an appropriate level of response whilst maintaining a high degree of personal and passenger Safety.

The **PW501** report also identifies:

- **Overspray from the first foam boss truck landed on the right wing. This was a contributing factor in the injuries suffered by those people who fell of the leading edge of the wing.**

PW501 – Although the fire (CFR) trucks arrived at the accident site very soon after the aircraft stopped, the initial attempts to extinguish the fire were not as effective as they might have been. The Flight Crew reported that they saw the trucks at a time of one minute and thirty seconds after the failure (#1 engine 13th stage compressor disc). The firemen reported seeing the slides inflate as they approached the aircraft and that the first few passengers were already on the ground when they arrived. This puts their arrival on the scene at approximately two minutes to two minutes and fifteen seconds after the failure.

On arrival at the scene, the foam boss (Red #82) was positioned off the left wing in the grass area and the dry chemical truck (Red #85) was positioned off the nose of the aircraft. Red #82 was not very effective as the left wing and the #1 engine prevented its foam from reaching the source of the fire. Overspray from the foaming fell on the right wing making the surface slippery for those passengers exiting out of the overwing exit.

A Pacific Western Operations Control Supervisor arrived at the accident scene just as the last few passengers evacuated the aircraft. As he was driven out to the scene he had radioed for taxis and ambulances to move the passengers. He assisted in getting the passengers into one group before they were transported to the Terminal.

**Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs**

An Air Canada Maintenance Manager also arrived at the accident scene very soon after the event to offer his assistance. At the request of the firemen, he entered the aircraft with them to check the switch positions in the cockpit. The firemen were concerned that the aircraft power was still on as there was a light on outside (Emergency Exit Lights).

The Maintenance Manager stated that he shut off "a guarded switch in the upper left-hand area (Battery switch). The passengers were moved to Gate 31 and the fire was brought under control by approximately 0800.

Technical Debriefs & Investigations

To facilitate ongoing awareness of roles, responsibilities and technical insight of the entire air crew team, the Pilot-in-Command must ensure that all Cabin Personnel are given a thorough, formal debriefing as soon as practical after the flight terminates and the passengers have disembarked. This applies to all abnormal as well as emergency occurrences. The debriefing must include a description of the problem by using as few technical terms as possible. Open dialogue and questions by Cabin Personnel are encouraged. The mandatory debriefs have been an appreciated enhancement that often go along way to diffuse post traumatic stresses and/or anxieties.

Thorough post-incident investigation practices are then initiated in tandem with Critical Incident Support Intervention. Additional dedicated technical debriefs are organized following declared emergencies or where requested by the crewmembers. Event and role sequences and all SOPS are reviewed to ensure their applicability and effectiveness and to ensure that the training approach supports this.

Emergency Response Services – A Crisis /Emergency Communications Link

Internal and external Emergency Response Services as well as sound Critical Incident Support Programs, are integral elements in the successful management of any occurrence. Proactive regular process reviews and drills for the established protocols are essential investments to ensure effective applications upon notification of, during and following an occurrence for the employees, passengers and their families.

Canadian Airlines regularly participates in these disciplines to continually validate and fine tune their effectiveness. The System Operations Center (SOC) in Calgary Alberta, acts as the nerve center to coordinate all operational activities. Annual (minimum) Emergency Response Team (ERT) conferences are facilitated with mandatory participation of all headquarter and field team members (Management & Labor representatives). All associated external agencies also actively participate in "mock exercises" based upon actual industry events. Guest speakers and related subject matter experts provide realistic insights. All participants benefit from the exposure to the entire occurrence perspective. Extensive post-exercise debriefs yield action items which are immediately actioned and integrated where applicable.

Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs

Airport Authority "table top exercises" are practiced regularly and stage occurrences to test coordination of all services and again response procedure effectiveness.

SOC also conducts daily Operations Conference Calls to review all abnormal and/or emergency occurrences for the system. A weekly Operations meeting is hosted in Vancouver. Senior Vice Presidents, Vice Presidents, Directors and operational Managers convene to review all occurrences from the preceding week. These review processes enable proactive SOP assessment and intervention to reduce the likeliness of recurrence. Conclusions and action items are communicated regularly to all line personnel to keep each individual informed of the bigger operational picture as well as the vital role each participant plays through the vigilant application of role , responsibility and compliance with established Standard Operating Procedures (SOP).

Company training facilities, including aircraft door mock ups are made available to Emergency Response Services and Military personnel. Facilitated by qualified Air Crew Training Emergency Procedures Instructors, aircraft system orientations are conducted as requested to ensure personnel familiarity with system designs, operations and associated personal safety precautions.

Conclusion

The critical importance of crisis / emergency communications must be proactively prioritized as a factor in crew performance and overall occurrence outcome. It must be adopted as an essential component of corporate safety priority and as part of the design profile of standard operating procedures. This must include all internal and external operational personnel and support services.

Simplicity in terminologys adopted and applied through Standard Operating Procedures is of even greater significance when operating with multi-cultural crew members that hold multiple fleet type qualifications.

Procedures and processes must be incorporated into the fiber of training program development and delivery.

To maintain effectiveness, **all communication procedures and process must be subjected to continuous scrutiny** to ensure their continued effectiveness. This must be factored into all operation event investigations.

Timely, uninhibited and accurate communications between the entire air crew team is an ongoing orchestration. It must be exemplified, taught, practiced and supported consistently in normal operations to ensure application in abnormal and emergency / crisis communication conditions, where it is most critical.

Kevin V. Bradley
Manager, Cabin Safety & Regulatory Affairs