



AIR LINE PILOTS ASSOCIATION, INTERNATIONAL

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Mr. Greg Phillips
Major Investigations Division
National Transportation Safety Board
490 L'Enfant Plaza East S.W.
Washington, D.C. 20594

Dear Mr. Phillips:

In accordance with the Board's rules, the Air Line Pilots Association (ALPA) submits the following comments to the Petition for Reconsideration by Avions De Transport Regional (ATR) related to the American Eagle (Simmons) Flight 4184 aircraft accident.

ALPA concurs with the NTSB's findings, probable cause and recommendations related to the accident and highlighted in the Final Report, which was adopted on July 9, 1996. The NTSB's investigation was thorough, un-biased and well balanced.

Part 845.41 of the NTSB's rules, entitled Petitions for Reconsideration or Modification, clearly states that petitions will be "*entertained only if based on the discovery of new evidence or on a showing that the Board's findings are erroneous...Petitions based on the claim of erroneous finds shall set forth in detail the grounds relied upon.*" Neither of these two requirements are met by ATR's submittal. ATR's petition does not contain new evidence, nor does it prove erroneous findings on the part of the NTSB. Therefore the documentation submitted by ATR should not qualify as a valid Petition for Reconsideration per the NTSB's rules.

A similar Petition for Reconsideration with many of the same concerns was submitted to the NTSB by the DGAC in November of 1996 and in January of 1997. The DGAC's comments were originally provided after their review of the NTSB's draft report, per ICAO Annex 13. The NTSB, after review of the DGAC's initial comments, issued the two-volume accident report for American Eagle Flight 4184. The DGAC's concerns were entertained by the NTSB and those that were deemed appropriate were incorporated into the final report. The NTSB issued their final report based upon the factual information gathered through the investigation as well as the party submissions (per NTSB Rules Part 845.27, Proposed Findings). Both the DGAC and ATR were parties to the investigation.

The current petition submitted by ATR covers most of the areas already addressed by the NTSB as part of DGAC's comments and petition. The ATR petition focuses on five primary areas: 1) The development and certification of the ATR-42/72 aircraft and the knowledge of the aerodynamic phenomenon involved in the accident; 2) The previous ATR-42 accidents and

incidents and the indication of a unique aerodynamic phenomenon; 3) The appropriateness of ATR's actions in response to the previous icing incidents, 4) Various NTSB report findings, and 5) The certification of the ATR-42/72 aircraft through the U.S. / French Bilateral Airworthiness Agreement. None of these areas contains any additional information that was not previously discussed or addressed by the NTSB during the investigation and in the Board's final report.

Commenting directly on ATR's Petition for Reconsideration, ALPA offers the following comments.

1. PRECURSOR TO THE 4184 ACCIDENT

A. Development and Certification of the ATR Aircraft

Section 1 of the ATR Petition for reconsideration addresses the development and certification of the ATR aircraft. It is the opinion of ATR that during the certification phase, the phenomenon that occurred on the accident airplane was never identified. While ALPA agrees that FAR 25, appendix C icing criteria is rather limited and certification per the FAR's does not require adequate aircraft handling qualities assessments in icing conditions, it must be remembered that Special Condition B6 that is mentioned in the petition is also conducted in Appendix C icing conditions. This requirement is simply handling qualities testing done under those icing conditions. Therefore, SC B6 does go beyond the FAR's in terms of aircraft handling and performance testing, but does not go beyond in terms of icing criteria.

The petition states that during SC B6 demonstrations, "*no aileron hinge moment anomaly comparable to that observed on Flight 4184 was ever encountered...*" ALPA agrees that no anomaly "comparable" to that observed on Flight 4184 was observed, however, that is not the issue. The issue is whether ATR was aware of any type of hinge moment anomaly during the design phase, certification phase and/or in-flight operational history of the aircraft.

During the field phase of the investigation, the NTSB Performance Group departed the accident scene and reconvened at ATR Headquarters in Toulouse, France. The group spent approximately two (2) weeks at the ATR facility. The task of the group was to review documentation concerning the original design and certification of the ATR-42 and -72 aircraft. This review was to focus on all aspects of the aircraft, but primarily the aircraft's control system design and operation. Numerous meetings were held with ATR design and flight test engineers. Volumes of data were reviewed including original flight test data.

Referencing page 7 of the Aircraft Performance Group's Field notes, flight test data, in the form of graphs, were reviewed where aileron hinge moment anomalies were seen. The notes state that: "*...Review of the graphs indicated and subsequent discussion with the flight test pilot who flew the airplane during the tests confirmed that the hinge moment problems were anticipated and reacted to as soon as perceived so as to not let the airplane significantly depart from controlled flight. AOA reduction was also accomplished after reaching the divergent hinge moments...It was agreed, in principle, that higher airspeeds and longer reaction times could result in significantly higher initial hinge moments and thus control forces during recovery.*" Therefore, it can be said that divergent hinge moments were encountered during certification

flight testing, although the results were not as severe or “comparable” to that of the accident aircraft.

In addition, the NTSB Aircraft Performance Group was informed by ATR engineers that hinge moment related design changes were required during the design and development history of the ATR control system (Reference NTSB Exhibit 13C, ATR-42/72 Lateral Control System Development History Factual Report). An intermediate design resulted in an aileron hinge moment reversal. This phenomenon was similar to that which caused the 4184 accident. The original flight test data indicates that at AOAs above 12 - 14°, the force required to maintain a given aileron position (hinge moment) actually began to decrease rapidly. ATR engineers also indicated during meetings with the Aircraft Performance group that the manufacturer did experience high aileron deflection rates at AOAs above 12-14°. For these reasons, a Stall Protection System (SPS) and vortex generators were installed on each model aircraft to provide suitable margin between aircraft operations and the hinge moment anomaly.

Referencing the Aircraft Performance Group Field Notes, there are numerous references to discussions that took place during the group’s Toulouse meeting. In that document, which was distributed to all members of the group, comments were made regarding certification test data such as “*Certain ATR et al. Icing certification handling qualities test data appeared to show aileron hinge moment anomalies at high AOAs...which is coincidentally about equal to the icing AOA threshold of the SPS...*”

The group also discussed the aileron balance and hinge moment design history. The field notes state: “*the ATR-42 and -72 aileron balance and hinge moment design/anomaly history were reviewed for us at our request with the findings that:...initial ATR-42 development saw 28 balance/hinge moment-related design changes...the final basic design of the ATR-72 aileron system resulted in divergent aileron hinge moments...which ATR et al. deemed to be too early.*” Again, hinge moment effects were identified, discussed and acted upon during design. Although the potential severity of this anomaly may have never been envisioned, it was known and dealt with.

Therefore, there were numerous precursors to the 4184 accident that were not appropriately addressed by either ATR, DGAC or the FAA. Therefore, ATR’s issues contained in their petition are unfounded and do not constitute “new information” or “erroneous” NTSB findings. The findings, probable cause and recommendations of the NTSB’s final accident report should stand and no changes should be made.

B. Special Certification Review (SCR) Results

Section 1, page 4 of the ATR petition begins with a discussion of the FAA’s Special Certification Review (SCR) Team that was convened after the accident. ATR puts great faith in the FAA / DGAC Special Certification Review (SCR) document that was issued on September 29, 1995, subsequent to the accident. ALPA is not quite as confident in the SCR document or its thoroughness in addressing the historical record of the ATR and its handling qualities.

The SCR was originally requested by the NTSB pursuant to the accident. However, only the FAA, DGAC and one member from NASA were permitted to attend. Therefore, the SCR lacked the input from all parties to the investigation. The SCR document is not as balanced or thorough as it could have been due to the lack of participation by all concerned parties. The extent of research and testing conducted during the SCR was inadequate to determine whether the ATR aircraft truly exhibits or exhibited any handling quality problems in icing conditions. The SCR certainly did not go into sufficient detail to address the flight conditions and the aircraft behavior of Flight 4184. The SCR report, because of the level of participation, is a biased and incomplete document. Therefore, using the SCR document as an argument against the NTSB's analysis is inappropriate.

Page 5 of the ATR petition states that "*...The flight test data and qualitative assessments made by the DGAC during certification of the ATR-42, ATR-72 basic, and ATR-72-211/212 did not indicate that any unsafe or atypical lateral control wheel force characteristics existed. This conclusion also was based on the comprehensive assessment of the airplane in icing conditions conducted in accordance with Special Condition B6. Results of tests performed at Edwards AFB with the 40 micron droplets, i.e., within Appendix C requirements, have confirmed this conclusion.*" It must be pointed out that **all testing mentioned in the SCR report was conducted within FAR 25, Appendix C icing conditions.** Although Special Condition B6 requires performance and handling qualities testing with ice shapes installed, those ice shapes are representative of Appendix C icing conditions only. All of the parties involved in the accident agree that Simmons Flight 4184 was being operated in icing conditions that exceeded those of Appendix C. Therefore equating these particular SCR findings to the ATR upset accident and incidents is inappropriate.

The ATR petition goes on to state that "*The flight test data and qualitative assessments made by the DGAC during certification of the ATR-42, ATR-72 basic, and ATR-72-211/212 did not indicate that any unsafe or atypical lateral control wheel force characteristics existed. This conclusion also was based on the comprehensive assessment of the airplane in icing conditions conducted in accordance with Special Condition B6.*" This may be true of some of DGAC's findings during certification, however, this is contrary to the control force information obtained and documented in the Aircraft Performance Group's field notes.

In addition, the SCR report goes on to discuss allowable control wheel forces under the regulations. The report states that these maximum allowable forces "*...could probably develop from ice accretion in freezing drizzle conditions.*" The report also indicates that "*Even though the adverse lateral control wheel forces only occur with an ice exposure in excess of FAR/JAR requirements, such an inadvertent encounter should not result in forces that exceed the short-term force limits of FAR/JAR 25.143...*" This indicates that actual control wheel force studies were not conducted as part of the SCR activities. Therefore, there is no way of knowing the amount of control wheel force resulting from the accident-specific ice accretions or what the flightcrew of 4184 experienced.

Another fact that speaks to the credibility and applicability of the SCR report are the limitations to which the SCR testing was conducted related to aircraft configurations. One must understand that Simmons Flight 4184 was operating on autopilot at the time of the autopilot disconnect and

subsequent upset. Page 48 of the SCR Report indicates "...Results of tests performed after the Edwards icing tanker tests indicated that if an autopilot disconnection occurred for any reason at the moment of the roll anomaly, the airplane could roll with a significant rate and reach high bank angle before the initiation of a manual recovery." This is precisely what Flight 4184 experienced, but was apparently not addressed or examined during the SCR testing.

At the end of section 1 of their petition, ATR states: "*Thus, the Roselawn accident occurred while the aircraft was being operated in an icing environment which the FAA's Advisory Circular AC20.117 had, since 1982, warned the aviation community about by specifically stating, 'flight in freezing rain should be avoided where practical.'*" This implies that the crew of Flight 4184 knew, or should have known, that the meteorological condition they were encountering was freezing rain. It was not until after this accident that the industry became aware of side window icing as a potential ATR-42/72 freezing rain indicator. Therefore, the implication that this crew, or any crew, had the means available to them to differentiate between icing conditions routinely encountered and conditions that were outside of the certification envelope of their aircraft is inappropriate.

The following points should be kept in mind when assessing the applicability and completeness of the SCR report:

- The SCR team did not take advantage of or have the benefit of all parties input to their assessment.
- Simmons Flight 4184 was operated in icing conditions outside of the certification envelope. This was unknown to the accident flightcrew as well as all flightcrews at that time.
- All SCR assessments were conducted in icing conditions within the certification envelope.
- Aircraft Performance Group field notes that highlight discussions with engineers at ATR contradict some points being made in the SCR report.
- There was no testing done by the SCR team to determine control forces experienced by the flightcrew.

For the above reasons, the issues contained in Section 1 of ATR's petition are unfounded and do not constitute "new information" or "erroneous" NTSB findings. Therefore, the NTSB's findings, probable cause and recommendations of the NTSB's final accident report should stand and no changes should be made.

2. PREVIOUS INCIDENT RELEVANCE TO 4184

ATR's petition states that the previous incidents involving ATR aircraft were different from 4184 and provided no warning of the unique Roselawn accident aerodynamic phenomenon. Many of the events and circumstances leading up to the accident (i.e. meteorological conditions, uncommanded aileron deflections, uncommanded autopilot disconnections, etc) bear strong resemblance to those circumstances involved in each of the other incidents. ALPA contends that precursors did exist that were not aggressively acted upon by either the manufacturer or the airworthiness authorities.

Section 2.1 of the ATR petition discusses the previous ATR incidents as identified in the NTSB's final analysis and their relevance to the 4184 accident. ALPA, as well as ATR, were

parties to the NTSB Aircraft Performance Group where the analysis of these events was conducted. ATR feels that none of the five incidents discussed in the NTSB report are relevant to the 4184 accident. The NTSB Aircraft Performance Group, however, determined that of the five identified, two were closely related (i.e. Continental Express @ Newark and Simmons Airlines @ Mosinee). ALPA concurs with the NTSB's assessment of each of these incidents. They are directly relevant to the accident flight.

Through analysis conducted after the events, all of the five identified incidents involved flight in environmental conditions that were determined to have been outside of the current icing certification envelope. However, all experienced some level of aircraft performance and handling quality degradations following exposure to environmental conditions and ice accretions that were not deemed hazardous or unusual by any of the flightcrews. None of the incident flights were being operated with flaps deployed, but higher airspeeds with lower flap settings would achieve similar angles-of-attack and ice accretion characteristics.

In 1992, ATR generated and provided to all ATR operators a document entitled All Weather Operations. The document addressed and discussed several interesting and relevant issues such as: The potential for ice accretion aft of the leading edges of airframe components; the potential for asymmetric wing lift and associated increased aileron forces necessary to maintain coordinated flight before aerodynamic stall and the difficulty in visually detecting the presence of associated clear ice. All of these issues, identified in 1992, are directly relevant to the circumstances surrounding 4184.

The pertinent facts surrounding these events will be addressed below. The flawed logic being presented by ATR will be highlighted and the relevance to Simmons Flight 4184 will be shown.

December 22, 1988 @ Mosinee

- a. ATR claims that the flight was operated in "...conditions which no aircraft is certificated for or permitted to operate in." However, prior to the 4184 accident, there was no way for an ATR flightcrew to identify whether they were operating in a freezing precipitation environment. The SCR report, which ATR relies on so heavily, indicates "...there are a limited means for the pilot to determine when the airplane has entered conditions more severe than those specified in the present certification requirements."
- b. ATR attempts to give the impression that the aircraft was in level flight at the time of the upset. In actuality, the flight was in a bank executing a procedure turn and a descent at the time of the upset.
- c. ATR's own analysis of this event contained some important conclusions that are not included in their petition. These include (Reference NTSB/AAR-96/01, Page 77):
"*The autopilot disengagement occurred owing to its internal safety devices. The ailerons tended to adopt the zero hinge moment position in the absence of pilot reaction. The maximum deflection reached was minus 12.5 degrees. This deflection introduced a high roll rate which added to the wing drop to take the aircraft to an 80 degree bank attitude.*"
The ATR analysis also stated "...although control stability was affected, owing to the

changes in hinge moment according to angle of attack, which were probably due to the presence of ice on the airfoil beyond the deicers (emphasis added), as is the case on all aircraft in freezing rain conditions."

April 17, 1991 – Air Mauritius

ATR conducted an analysis of this event in July 1991. Although the incident may not be identical to the Roselawn event, again ATR reached several pertinent conclusions that were directly relevant to some of the circumstances of the 4184 accident.

- a. *"The anomalies of the thrust / drag balance, lift, and lateral balance lead us to believe that the incident on ATR 42, n208 (Air Mauritius) is associated with ice build up which was not detected by the crew and the ice detector (transparent ice, location?)."*
- b. *"The ice accretion caused dissymetry ("heavy wing") which was difficult to control by the autopilot. The unusual control forces then encountered by the crew on disconnection led to a 40 degree roll excursion..."*
- c. *"...As these control forces may be unusual, it would be desirable for the crews to be trained to face these roll out-of-trim situations."*

These 'unusual control forces' and "out-of-trim" situations should have given the airworthiness authorities and the manufacturer a warning of a potentially dangerous situation. Certainly this event, taken into account with the previous event, should have begun to identify a trend toward a potentially hazardous situation.

August 11, 1991 over South Wales – Ryanair

ATR makes two claims within their petition that must be countered. First, they indicate that an AOA of 10-13° is "well above the icing stall warning threshold". This is untrue. The icing stall warning threshold is at 11deg. Therefore, an AOA of 10-13° is exactly where it should be for stall warning.

The second point that must be made relates to their comment that "*the aircraft was operating in icing conditions exceeding the aircraft's certification envelope.*" This implies that this could have been known by the flightcrew and exited. However, a means to identify icing conditions on the ATR-42/72 that exceeded the certification envelope was not identified until after the 4184 accident.

March 4, 1993 @ Newark – Continental Express

ATR claims that this incident is not related to 4184, however, many of the facts surrounding this event, in conjunction with previous upsets on ATR aircraft, should have prompted concern by the airworthiness authorities, and provided a clear warning of a handling quality problem on the aircraft.

The autopilot disconnected and the upset occurred at approximately 7° angle-of-attack, well below the stall protection system stick shaker angle-of-attack. The flightcrew's NASA ASRS report indicated that *"Apparently, our problem was caused by ice formation on top of the wing in an unprotected area...The aircraft recovered again, and the captain observed that there was approximately 3 inches of ice aft of the leading edge boots spanning the entire length of the wing. The ice extended back as far as could be observed..."*

The ASRS report also states that the same phenomenon was encountered several times. This is evident from the FDR trace for the event. It is interesting to note that at each time the aileron deflected to the left toward the aileron limit, the AOA was at nearly the same value, indicating that the event was being triggered by a specific AOA.

ATR states that the *"amplitude of the prevailing wind gradients could have caused, or greatly contributed to, the aircraft upset and roll oscillation."* Given the minimal analysis done after this event, the local turbulence being encountered by the flight could have also simply allowed the local AOA on the aircraft to increase above the necessary trigger angle to cause the upset.

Given the flightcrew's observation of ice on top of the wing in an unprotected area, the aircraft behavior during the upset and the facts surrounding the 4184 accident, the events of this incident were a definite precursor to the 4184 accident. Yet ATR claims that this type of scenario had never been identified prior to the 4184 accident.

January 28, 1994 @ Burlington, Massachusetts – Continental Express

The final incident that the NTSB Aircraft Performance Group felt was relevant to the 4184 accident was another Continental Express ATR-42 in January 1994. ATR's analysis of this event again identified some significant factors that are directly relevant to the 4184 accident. Their analysis states:

- *"...the Continental Express ATR 42 was subjected to a type of icing which was different from the one considered during the certification process, both because of the degree of lift deficit and drag increase and the rapidity of the downgrading process."*
- *"This incident revealed an evolution in drag (and lift) which was incompatible with the most severe assumptions envisaged by the certification regulations ("conventional icing, leading edge shapes)."*
- *"This type of evolution was similar to the one observed in the incidents concerning aircraft 161 and 208 and for which the assumption of a low pollution, but covering the major part of the chord, had been made."*

It is interesting to point out that aircraft 161 and 208 refer to the Ryanair and Air Mauritius aircraft, respectively, both of which ATR alleges are unrelated to the 4184 event. This should have been another significant incident that caused concern with ATR, DGAC and the FAA.

Conclusions

When reviewing the previous incidents involving ATR aircraft and determining their relevance to 4184, it is important to understand several key points:

- The fact that ice was accreted at a different flap setting on the other ATR incidents is important, but is not an indicator of an unrelated event. The key element in terms of ice accretions and its relationship to the 4184 event is the angle-of-attack at which the ice was accreted. In the case of 4184, the ice ridge was formed on the upper surface of the airfoil, aft of the ice protection equipment, at a relatively low angle-of-attack. As the angle-of-attack increased during flap retraction, the airflow separated over the airfoil due to the ridge of ice, causing the ailerons to auto-deflect.

This accretion location can be attributed to at least two factors: type of ice being encountered and the angle-of-attack of the wing during the encounter. Ice accretions can occur at the same physical location on a surface independent of flap setting. Therefore, the correct combination of airspeed and flap setting, in the same meteorological conditions, can achieve similar ice accretion characteristics. Therefore, stating that an incident is unrelated because the ice was accreted while the aircraft was at a flaps 0 configuration (versus flaps 15 for Flight 4184) is an invalid argument.

- Stating that an incident is unrelated because the event occurred at an angle-of-attack different than 4184 is an invalid argument. Again, the critical factor is where the ice accretion is located on the airfoil and the resulting flow separation caused by that accretion. Therefore, with varying locations of ice accretions on an airfoil, varying flow separation trigger angles-of-attack are possible. Therefore, flow separation trigger angles can vary depending upon the location of a critical ice shape.

The prior incidents and accidents provided clear evidence to the DGAC and the manufacturer that the ATR-42/72 aircraft exhibited aircraft performance and handling quality problems in certain types of icing conditions. This evidence should have indicated to DGAC, ATR and the FAA that further testing should be conducted to determine the extent of such problems and preclude the potential for future similar events.

For the above reasons, the issues contained in Section 2.1 of ATR's petition are unfounded and do not constitute "new information" or "erroneous" NTSB findings. Therefore, the findings, probable cause and recommendations of the NTSB's final accident report should stand and no changes should be made.

3. PREVIOUS ACCIDENT RELEVANCE TO 4184

A critical accident that occurred in 1987, 7 years prior to the 4184 accident, has elements that are directly related. This accident report should be reviewed in its entirety to better assess its relevancy to the 4184 accident and the amount of information that was available to the investigative authorities and the manufacturer.

On October 15, 1987, an ATR-42 accident occurred over Como, Italy. The accident report, generated by the Chairman of the Board of Inquiry, cites several pertinent points of interest that are directly related to the facts surrounding the accident involving Flight 4184. A transcript of the Como Cockpit Voice Recorder (CVR) clearly showed that the crew was aware of ice accretions on the upper surface of the wing. Comments such as *"It looks as if it has formed on the back, doesn't it?"* and *"On top, look."* were made by the flight crew.

Specific conclusions drawn by the Board of Inquiry stated that, *"Formation of ice on the wings and horizontal tail boom section of different characteristics from those envisaged and considered in the certification. In particular: ice accretion, with Airframe De-Ice system switched on, beyond wing boots and horizontal tail boom sections..."* The Board Of Inquiry went as far as to recommend that the manufacturer *"...extend the zone protected from ice from the leading edge of the wings and tail boom, by a suitable system;..."*

The boots were not extended by ATR until after the 4184 accident. The precursors were not limited to just previous incidents. This accident was a direct and definite precursor event as well. The analysis conducted of the Como accident identified specific areas of concern that are directly related to the 4184 accident. These areas of concern were known by the manufacturer and the airworthiness authorities in 1987, but were not aggressively acted upon.

4. UNIQUE CIRCUMSTANCES OF THE ROSELAWN ACCIDENT

Section 2.3 of the ATR Petition discusses the environment that 4184 was operating in as *"an icing environment outside the certification envelope that included the presence of Supercooled Drizzle Droplets (SCDD), a relatively new phenomenon, not well understood by the aviation industry at the time of the accident."* Although it is agreed that the phenomenon was not well understood at the time of the accident, SCDD is not a new phenomenon. Meteorological conditions that exceed the icing envelope are not easily forecast or identified and are encountered on a regular basis. In fact, conditions outside the certification envelope were cited in several of the previous ATR incident reports.

The petition goes on to state *"the SCR team, in reviewing the previous ATR icing-related incidents concluded that there is no evidence that the ATR-72 had any problems with icing conditions for which it was certified."* ALPA concurs with this statement, based upon the knowledge gained during this investigation. However, based upon analysis conducted, it appears that the 4184 accident and several of the other ATR icing-related incidents occurred in meteorological conditions for which the aircraft was not certified. Therefore, the SCR comment above is moot and is not relevant to this document.

Sufficient evidence existed, based upon the previous incidents and accident to determine that this particular aircraft may experience a roll control anomaly in the event that conditions outside the certification criteria were encountered and operated in. It must also be clarified that in order to avoid such meteorological conditions, they must be able to be identified. Until the post-accident testing was conducted, there were no visual cues available to flightcrews to identify these meteorological conditions.

Section 2.4 of the ATR Petition discusses NTSB report errors. The petition cites several specific quotes from the NTSB's report. It must be noted that each of these facts were delineated in the Aircraft Performance Group's Field notes that were generated, reviewed and accepted in Toulouse immediately after the accident.

Page 20 of the Petition references the Chief Test Pilot's testimony at the March 2, 1995 Public Hearing. ATR claims that the NTSB took the testimony out of context and mis-represented the response by Mr. Defer to the following question: "*Do you feel that the average line pilot can recover from this type of event?*" Mr. Defer's response, "*It is the same answer, sir.*" was not included in the Petition in its entirety. The entire response, as transcribed is "*It is the same answer, sir. It's – if you want me to tell you that such a phenomena that we did not know is viable then I go to the answer and the answer is, no. And had we know it before, of course, we would have done something.*" There is little room for interpretation of that response. Mr. Defer stated that the average line pilot could not have recovered from that type of event. Presently however, with the level of information available pertaining to the phenomenon, meteorological conditions, aircraft behavior, visual cues and recovery techniques, an event of this magnitude is less likely, but still possible.

The petition goes on to state, "*post-Roselawn testing at Edwards AFB and in Toulouse conducted by the chief test pilot confirmed that Flight 4184 was recoverable, despite the fact that the control wheel forces were heavier than normal.*" One must remember that the Edwards testing was conducted behind an icing tanker aircraft with only a portion of the wing being iced. Therefore, the full effects of a totally iced airfoil could not be examined. In addition, a full examination of the control wheel forces experienced by the 4184 crew was never conducted. All testing maneuvers were conducted at or near 1g while the accident flight experienced greater than 2g's during the recovery. Analytically, it can be expected that the control wheel forces would increase greatly at higher g loadings, however, no testing was ever done to validate that theory. Therefore, simply stating that flight tests showed recoverable forces cannot be validated using information that is currently available.

Page 22 of the ATR Petition states that "*...there is no evidence that the Mosinee incident involved an 'ice accretion behind the de-ice boots in front of the ailerons'*". However, ATR's own analysis of this event contained some important conclusions that are in direct contradiction to this statement. These include (Reference NTSB/AAR-96/01, Page 77): "*The autopilot disengagement occurred owing to its internal safety devices. The ailerons tended to adopt the zero hinge moment position in the absence of pilot reaction. The maximum deflection reached was minus 12.5 degrees. This deflection introduced a high roll rate which added to the wing drop to take the aircraft to an 80 degree bank attitude.*" The ATR analysis also stated "*...although control stability was affected, owing to the changes in hinge moment according to angle of attack, which were probably due to the presence of ice on the airfoil beyond the deicers* (emphasis added), *as is the case on all aircraft in freezing rain conditions.*"

For the above reasons, the issues contained in Section 2.2 of ATR's petition are unfounded and do not constitute "new information" or "erroneous" NTSB findings. Therefore, the findings, probable cause and recommendations of the NTSB's final accident report should stand and no changes should be made.

5. FOREIGN AIRCRAFT CERTIFICATION

The NTSB has a firm understanding of the notification requirements imposed on the exporting authority as part of the Bilateral Airworthiness Agreement (BAA). The BAA clearly states that *“The aeronautical authorities of the exporting state shall, in respect to products produced in that state, ...shall also assist in analyzing those major incidents occurring on products to which this Agreement applies and which are such as would raise technical questions regarding the airworthiness of such products.”* This statement is not open to interpretation, and based upon the significance of events surrounding the prior ATR accident and incidents, information on every event should have been provided to the FAA.

Early in the petition, ATR made several references to the fact that the previous accident and incidents involved ATR-42 aircraft and not ATR-72 aircraft. Using this as an argument for a lack of a requirement to notify the appropriate authorities is unfounded and irresponsible. And again, the SCR document, which ATR relies on so heavily, states that, *“Data for the ATR-42 were not specifically analyzed because the aileron servo tab gearing on that airplane provided more lateral wheel force per aileron deflection than on the ATR-72. Therefore, it was considered less critical in terms of producing uncommanded aileron characteristics.”* With both aircraft being nearly identical in design and system installation, the fact that the ATR-72 may be more susceptible to “uncommanded aileron characteristics” should have indicated that a more in-depth review of the aircraft’s performance was warranted.

Because the previous ATR accident and incidents were related to the 4184 accident in many ways, the guidelines for continuing airworthiness under the BAA and the FAA’s continuing airworthiness programs failed to identify and correct any aircraft deficiencies prior to the accident. The guidelines should not be such that they are open to interpretation by any airworthiness authority.

As it relates to certification and continuing airworthiness, ALPA has two main concerns: 1) The Continuing Airworthiness review of the ATR aircraft did not include a thorough review by all airworthiness authorities of any aircraft accident / incident history to determine if a handling quality problem existed; and 2) An inadvertent encounter with icing conditions outside that which the ATR aircraft was certificated could cause a total loss of control of the aircraft.

The NTSB made many significant and pertinent comments concerning the continuing airworthiness of aircraft through BAA’s and the FAA’s own internal processes. The FAA relies too heavily on the foreign airworthiness authorities and must take a more pro-active role in foreign aircraft certification in the U.S. and continuing airworthiness issues. ALPA agrees with all of those findings. Not only were they pertinent at the time of the 4184 accident, little has been done since then to correct any certification and continuing airworthiness procedural inadequacies.

For the above reasons, the issues contained in Section 5 of the ATR petition are unfounded and do not constitute “new information” or “erroneous” NTSB findings. Therefore, the NTSB’s

findings, probable cause and recommendations of the NTSB's final accident report should stand and no changes should be made.

6. HUMAN FACTORS ISSUES

Section 6 of the ATR Petition presents a brief narrative of the flight crew performance, and states that the NTSB report fails to "*formally address all of the diverse factors, causal and/or contributory...*" and "*acknowledge the relevance of the significant human factors issues involved in this accident.*"

The entire discussion of flight crew performance presumes that the ice accretion leading to this accident presented unique cues to the crew, and that the crew should have acted on those cues prior to losing control of the airplane. An incorrect presumption on ATR's part is that the flight crew's casual behavior distracted them from their duties and caused them to incorrectly analyze the ice accretion.

In his testimony at the public hearing, while addressing the previous ATR roll upsets, Mr. Andre Bord stated:

"We could detect some similarities with these [previous to Roselawn] accidents but we have to specify the uniqueness of the aircraft 401 behavior. We have never seen an event with such low drag -- and the events which occur there is not like stall. It is a typical uncommanded aileron deflection occurring at a very low angle of attack. In that terms, the aircraft 401 accident is unique."

There is no reason whatsoever to believe that the ice accretion witnessed by the flight crew of Flight 4184 was in any way unique to their experience or indicative of a serious problem. They had responded correctly to the ice chime, and all ice protection systems had been in operation for fifteen minutes prior to the upset. The rate of ice accumulation was such that it took seven minutes from the first detection (aural warning) of accretion to the comment on the CVR, "*I'm showing some ice now*". The word "now" indicates that the individual who made the statement had been looking for signs of ice accretion prior to that point.

Some two hours after the Roselawn accident, another ATR-72 experienced a stall buffet while approaching South Bend, Indiana. In the flightcrew's NASA ASRS report, they stated:

"Acft was being vectored for an apch into SBN in flt conditions that included light rain and temps near freezing. Anti-icing and deicing equip was in use at the time. No ice was visible on the windows, wipers, or ice evidence probe mounted just outside the capt's window. Also, no ice was seen on the leading edge of the wing. While being vectored to intercept the loc, a buffet was noted at 170-180 kts. Pwr was advanced briskly, and within 2 to 3 seconds, the buffet stopped. Closer inspection of the wing showed that a ridge of ice about 1/2 inch thick had formed on top of the wing just aft of the boot. Since I had not experienced ice buildup that looked like this in the past, the decision was made not to change confign until the ice melted off during apch (surface temp was 37 degs f). An uneventful lndg was made at sbn. This event mainly emphasizes that, even though ice buildup may not be seen on the parts of

the acft where it is usually seen, it may still be building in significant quantities. Callback conversation with rptr revealed the following info: rptr stated that normal way to determine if ice is forming is an ice probe outside the cockpit window. When ice forms on the probe, it is probably forming on the wing. However, on this flt, ice was forming on the wing, but not on the probe. Flc increased airspd to fly out of buffet range and kept airspd high until dsnding to lower alt and they could see the ice start to melt off. Temp at lower alt was 37 degs f so they felt ice would leave the acft. They were able to reduce airspd, extend gear and flaps, and make a normal apch. Rptr stated that acft flies well in rime icing but not well when clr has formed. From the cockpit the flc can see about 10 percent of the wing behind the leading edge. This is their best indication of icing. At night time, as in this case, the acft has a strong light that illuminates the top of the wing that originates from the side of the fuselage. This is how they determined the buffeting was caused by the formation of ice. De-icing boots were effective as far as they cover the wing. Where the boot does not cover is where the ice formed. Deicing is ctled by the flc turning on the switch and setting the outside temp in the ctl panel. This determines the freq the boot cycles to break off any ice. This incident took place about 50 mi and 2 hrs from where another ATR crashed that day."

ATR has indicated that the characteristics of this type of ice accretion were very unique. Because of these unique characteristics, the flightcrew was deprived of at least one critical indicator of severe ice accretions; drag. The South Bend flight crew, who presumably had not left the cockpit for reasons of physiological need nor been working with the ACARS, also were not able to detect any ice accretion whatsoever until they encountered a stall buffet at high speed. Only after a concentrated inspection did they notice an ice ridge on the upper surface of the wing. Therefore, there is every reason to believe that the ice accretion that caused the 4184 upset and the environment in which the crew was operating did not appear as anything unusual to the flightcrew based upon their operational experience.

Assuming adequate visibility conditions, it is possible that the 4184 crew might have detected a ridge prior to the upset had they performed the same concentrated inspection that the South Bend crew did. However, the 4184 crew was not afforded any aircraft performance cues (i.e. stall buffet) prior to their upset. In the absence of any indications of unusual icing, or of any training regarding the limitations of icing certification and detection, or any visual or degraded aircraft performance cues that would have indicated a problem, there was no reason for the crew to believe that their normal methods of ice evaluation were inadequate. These same methods of evaluation had always been adequate for them in the past, and also were considered adequate by the South Bend crew until they received the stall buffet.

In addition, the SCR report, which ATR so heavily relies upon in their initial argument of the ATR's compliance to certification, indicates that "...there are a limited means for the pilot to determine when the airplane has entered conditions more severe than those specified in the present certification requirements." In other words, the SCR report, of which ATR assisted in the preparation, concludes that at the time of the accident, the flightcrew did not have the tools available to them (i.e. cues, guidance, etc.) to determine that they were encountering an icing environment that their aircraft had never been certificated to operate in.

Had the crew known or suspected that they were operating in an environment that was hazardous, dangerous, or exceeded that with which the aircraft had been certificated, they would have requested a course or altitude change to exit those conditions. Keeping these options in mind, it is important to remember that within **forty-five** seconds of the first officer's remark to the captain, "*We still got ice*", ATC issued a descent clearance to the flight. This descent clearance issued by negated any need on the crew's part for an immediate action to exit those conditions.

ATR infers that the crew was not maintaining situational awareness during their hold based upon "*flight attendant spent an extraordinary amount of time in the cockpit...captain and first officer were engaged in extensive distracting conversations...captain left the cockpit immediately after the icing warning chime was activated...no discussion between the flightcrew regarding the severe icing conditions in which the aircraft was holding.*"

The factual record indicates that the crew was well aware of their situation and took the appropriate steps to deal with their situation, as they understood it. In support of the argument that the flightcrew was aware of their situation, ALPA offers the following points:

The comment made by the first officer, "*We still got ice*", indicates that the crew was maintaining a high level of awareness on their part about the conditions that they were operating.

The fact that the ice protection system was cycled from OFF to ON several times in response to an ice detector warning indicates that the flightcrew was aware of their surroundings, were cognizant of the environment that their aircraft was operating and were aware that their aircraft was occasionally accreting ice.

We have highlighted the apparent "routineness" of the ice accretions that this flight was experiencing. This "routineness" was not limited to just this crew. Another crew in the same geographic area on that day experienced an ice-induced incident while operating in or around the same weather system. This routineness or familiarity with icing conditions that they were experiencing more than likely led to the crew being comfortable in the hold. Factual data related to the crews reaction to the icing conditions and their use of the pneumatic de-icing system indicates that the icing conditions they were experiencing and the ice accretions they were encountering were not unique to their experiences. The crew had no reason to believe that the icing conditions they were experiencing were severe.

In addition, their aircraft had been certificated to operate in icing conditions, as evidenced by the installation of pneumatic de-icing equipment and manual guidance on its operation. This fact further instills in all flightcrews the belief that their aircraft can safely operate in certain icing conditions. Based upon their knowledge at the time of the accident, and their familiarity with icing conditions, there would have been no reason for the captain to believe that this would have been an inopportune time to excuse himself for physiological reasons.

The captain inquired about the status of their hold within one minute of his return to the cockpit. This inquiry and the first officer's response, updated the captain on the situation

with regard to their Expect Further Clearance (EFC) time provided by ATC. The captain then knew that in approximately four and one half minutes, he should be getting a flightpath change by departing the hold.

7. CONCLUSION

The factual analysis conducted by the NTSB, which resulted in the July 9, 1996 final report, initiated a number of significant industry activities related to inflight icing: FAA Icing Plan, Ice Protection Harmonization, Flight Test Harmonization, Rulemaking regarding operations in icing conditions, to name a few. These activities were initiated based upon a thorough investigation in which a number of industry deficiencies were identified related to meteorological icing understanding, aircraft performance in icing conditions, certification of aircraft (domestic and foreign) and overall operations. These activities must continue with the same or greater level of aggressiveness in order to make the overall aviation operation safer. Any degradation in the importance of any of the NTSB's findings could negatively impact these industry activities. ALPA strongly urges the NTSB to keep this in mind as they assess ATR's concerns.

Ample evidence exists to show that both the design and certification history as well as the previous accident / incident history of the ATR aircraft provided more than adequate precursors to the 4184 accident. Had the manufacturer, airworthiness authorities, or investigative bodies acted more aggressively in response to repeated incidents in icing conditions, the 4184 accident might have been averted.

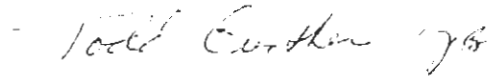
The process described under the Bilateral Airworthiness Agreement (BAA) between not only the DGAC and the US, but all BAA's must be reviewed and revised to ensure that the certifying authority in the country of operation has more input into the certification process. In the case of the ATR aircraft and the incident history, the information was either not readily available or not appropriately dispositioned upon its receipt.

The issues contained in ATR's Petition for Reconsideration have been previously submitted to the NTSB by the DGAC both in the form of comments to the NTSB's draft factual report and a Petition for Reconsideration. These issues have been thoroughly reviewed and adequately addressed by the NTSB in their report.

For all of the reasons cited in this response, the document submitted by ATR does not qualify as a valid Petition for Reconsideration since it does not provide any new evidence and does not support erroneous findings on the part of the NTSB. Their comments are inappropriate and unfounded, and in many cases, contradictory to their own incident analysis conducted after several events. Therefore, the NTSB's findings should stand and no changes should be made to the NTSB accident report.

ALPA appreciates the opportunity to comment on the Petition for Reconsideration by ATR.

Sincerely,

A handwritten signature in cursive script that reads "Todd Gunther".

Todd Gunther
Chairman, ALPA Accident Investigation Board

cc: ATR Party Coordinator
FAA Party Coordinator
DGAC