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**A) Introduction**

Aviation safety is the condition precedent to all commercial airline activities; the huge numbers of people travelling on airlines in the Global North<sup>1</sup> know that flying is safer than driving, and it may even be safer than staying at home.<sup>2</sup> Some of the world's major airlines have been operating for nearly two decades without a single passenger fatality.<sup>3</sup> This simple reality inspires the confidence that allows millions to break the bonds of earth as they make routine trips for work or pleasure, across the country or around the world.

The very notion of "Frequent Flyer" confirms that there is no perceived danger in being a passenger and the only work-place fatality statistics that include a specific count for flight attendants are associated with the events of September 11<sup>th</sup> 2001.<sup>4</sup>

Complaints about security screening, baggage fees or airline food are common, but currently in the global north, there are remarkably few public concerns about airline safety.

Regulators will claim that this impressive safety record is almost solely due to their efforts; however this is not entirely true. By any standard, the amount of regulation is huge; in the late 1960's the paperwork associated with the certification process that Boeing undertook in order to sell the 747 to domestic and foreign airlines weighed almost as much as the prototype.<sup>5</sup>

However, a growing number of airlines have much higher standards than the regulator, and many others have achieved impressive safety records in the complete absence of a regulator.

It is a fact that market driven and market dependent mechanisms are playing an increasingly important role in keeping our skies safe.

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<sup>1</sup> The term "Global North" includes North America, the European Union, most of the former Soviet Union, Japan, Australia and New Zealand. See Paulos Milkias, *Developing the global south: a United Nations prescription for the third millennium*, (Algora Publishing, 2010): 45. It probably also includes South Korean, Singapore, Taiwan and Chile.

<sup>2</sup> Charles Bremner, "Flying still safer than staying at home" *Times Online* (June 10, 2009) available at (<http://www.timesonline.co.uk/tol/news/world/europe/article6466090.ece>).

<sup>3</sup> See *infra* Appendix II: International Aviation Safety 1986-2011.

<sup>4</sup> 2,886 work-related fatalities, including the deaths of 25 flight attendants resulted from the events to September 11th. See Bureau of Labor Statistics, "National Census of Fatal Occupational Injuries in 2001" Press Release, USDL 02-541 (United States Department of Labor September 25, 2002) 2, available at (<http://www.bls.gov/iif/oshwc/cfoi/cfnr0008.pdf>) p. 2

<sup>5</sup> P. Paul Fitzgerald, "Freedom to Fly; Route Deregulation in Canada's Airline Industry" (1989) 14 *Ann. Air & Space L* 47 at 49.

It is also a fact that the competence of regulators is being questioned in many quarters and that regulatory functions are increasingly being delegated to regulatees.

This article will examine all of these developments and question whether it is not time to explore if there is not too much regulation and whether a greater reliance on private sector mechanisms would not result in any reduction of safety standards.

## **B) Regulation of Aviation Safety**

All countries, regardless of economic, political, social or geographic factors, regulate the safety of the airline industry. Their obligations are found in the *Chicago Convention*<sup>6</sup> and its predecessor, the *Paris Convention*.<sup>7</sup> States are responsible for the certificate of airworthiness<sup>8</sup> and consequently for the safety of aircraft.<sup>9</sup> They are also responsible for the licensing of personnel<sup>10</sup> and by extension, human factor issues.<sup>11</sup> Other responsibilities include the regulation of aircraft communications systems<sup>12</sup> and the investigation of accidents.<sup>13</sup>

The burden on safety regulators is significant; when Air New Zealand began operating the Boeing 747, New Zealand authorities had to provide “type approval” for the 747.<sup>14</sup> Other nations with less technical expertise<sup>15</sup> might choose to accept the certification of the country in which the aircraft was designed.<sup>16</sup>

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<sup>6</sup> *Convention on International Civil Aviation*, Dec. 7, 1944, TIAS 1591, 15 UNTS 295, ICAO Doc. 7300. [Hereinafter *Chicago Convention*].

<sup>7</sup> *Paris Convention on Aerial Navigation*, 11 LNTS 174. [Hereinafter *Paris Convention*]. It was signed at Paris on October 13, 1919.

<sup>8</sup> Article 31 and *Annex 8* of the *Chicago Convention* and Article 11 of the *Paris Convention*.

<sup>9</sup> Article 38 of the *Chicago Convention* allows a State to deviate from complying with international standards if it notifies the ICAO Council.

<sup>10</sup> Article 32 and *Annex 1* of the *Chicago Convention* and Article 12 of the *Paris Convention*.

<sup>11</sup> These include flight crew hours of service and Crew Resource Management. See J.J. Coyle, R.A. Novack & E.J. Bardi, *Transportation: A Supply Chain Perspective* Cengage Learning, 2010), 241 and B.G. Kanki, R.L. Helmreich & J.M. Anca, *Crew Resource Management* Academic Press/Elsevier, 2010).

<sup>12</sup> Article 30 and *Annex 10* of the *Chicago Convention* and Article 14 of the *Paris Convention*.

<sup>13</sup> Articles 26 and 37(k) and *Annex 13* of the *Chicago Convention*.

<sup>14</sup> Type approval involves approving the design and specifications of the aircraft. It is a condition precedent for the provision of the “certificate of airworthiness” that an aircraft must possess in order to operate commercial airline service. See ([http://www.caa.govt.nz/aircraft/Type\\_Acceptance\\_Reps/Boeing\\_747-4F6.pdf](http://www.caa.govt.nz/aircraft/Type_Acceptance_Reps/Boeing_747-4F6.pdf))

<sup>15</sup> Our Airline, the national carrier of tiny Nauru (population 10,000) operates a single 737-300, purchased with financial assistance from Taiwan, on weekly services to Australia and Fiji. See IBP USA & U.S.A.I.B. Publications, *Nauru: A Spy Guide* (Intl Business Pubns USA, 2007) 66. The aircraft bears Australian registration VH-INI. Air Seychelles, the government –owned carrier of the Seychelles (pop 87,000), operates several long-haul wide-body flights to Europe, using locally-registered aircraft. See B.R. Guttery, *Encyclopedia of African airlines* (McFarland, 1998) 157-158. Seychelles is almost certainly receiving technical assistance from other countries.

<sup>16</sup> Worldwide, relatively few countries have the capability to design and manufacture commercial jet-powered airliners; Brazil (Embraer) Canada (Bombardier) France (Aerospatiale) Germany (VFW-Fokker) Netherlands (Fokker) Japan (Mitsubishi) Russia (Ilyushin, Tupolev), the U.K. (British Aerospace), the U.S. (Boeing). These countries’

In other cases, the State simply does not have the resources to regulate aviation safety:

“The authorities with responsibility for regulatory oversight of Sierra Leone have shown an insufficient ability to implement and enforce the relevant safety standards in accordance with their obligations under the *Chicago Convention*. Sierra Leone lacks an appropriate system in place to oversee its operators or the aircraft, and does not have the technical capability or resources to undertake such a task.”<sup>17</sup>

### 1) Investigation of Accidents

Indeed, many nations find themselves in situations where the level of regulatory expertise is not adequate to the task to be performed. For instance, Art 26 of the *Chicago Convention* mandates that the State where an accident occurred is in charge of the investigation. *Annex 13* of the *Convention* also permits the participation of accredited representatives of the State of Registry and the State of Manufacture. Thus, when a French airline’s American-built DC-10 was blown up over Niger’s desert in 1989, local authorities were quick to reach an agreement with France’s Bureau d’Enquêtes et d’Analyses.<sup>18</sup> In 2000, when a Kenya Airways A-310 crashed in the Ivory Coast, Canada and France lent their expertise to the accident investigation.<sup>19</sup> The same year when an Omani-registered A-320 crashed in Bahrain, America’s National Transportation Safety Board (NTSB) served as the “Investigator-in-Charge.”<sup>20</sup> More recently, when a 737 crashed on a domestic flight in Indonesia, local authorities sought Australian and American assistance,<sup>21</sup> and when a TACA-operated Airbus A320 crashed in Tegucigalpa, Honduras, local authorities were quick to hand jurisdiction over to other nations.<sup>22</sup>

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authorities are responsible for the type certification of aircraft designed and manufactured in their territory. China is acquiring these capabilities and created the Commercial Aircraft Corporation of China in 2008.

<sup>17</sup> Regulation (EC) No 474/2006 establishing the Community list of air carriers which are subject to an operating ban within the Community referred to in Chapter II of Regulation (EC) No 2111/2005 of the European Parliament and of the Council, 2006 O.J. (L 84) 14 at 20.

<sup>18</sup> See Journal Officiel de la République Française, le 19 décembre, 1991; Edition des Documents Administratifs; « Commission d’Enquête sur l’accident survenue le 19 septembre 1989 dans le désert du Ténéré (Niger) à l’avion DC-10-10 immatriculé N 54629; Rapport Final », 6.

<sup>19</sup> See République de Côte d’Ivoire, Ministère des Transports, Commission d’Enquête « Rapport Final sur l’accident survenue le 30 janvier 2000 en mer près de l’aéroport d’Abidjan à l’Airbus A310-304 immatriculé 5y-BEN et exploité par la compagnie Kenya Airways » 10-11.

<sup>20</sup> See Kingdom of Bahrain, *Accident Investigation Report, Gulf Air Flight GF-072 Airbus A320-212, REG. A40-EK on 23 August 2000 at Bahrain* (10 July 2002) Appendix A, A-1.

<sup>21</sup> See National Transportation Safety Committee, Boeing 737–497 PK–GZC Adi Sucipto Airport, Yogyakarta Indonesia 7 MARCH 2007 Aircraft Accident Investigation Report KNKT/07.06/07.02.35, 27.

<sup>22</sup> The accident investigation was conducted by El Salvador’s Autoridad de Aviación Civil, representing the State of the operator, as invited by Honduras, the State where the accident occurred. El Salvador in turn, delegated most the complex technical work to America’s NTSB representing the State where the engines were made, and France’s Bureau d’Enquêtes et d’Analyses, as representatives of the State where the aircraft was manufactured. Additional investigators came from Ireland, the State of Registry of the aircraft, see (<http://www.aac.gob.sv/archivos/cai/390.pdf>).

The investigation of major aviation accidents requires both detective skills and profound engineering and scientific analysis. In 1974 after a DC-10 crash<sup>23</sup> in the Paris suburbs, France's Bureau d'Enquêtes et d'Analyses (BEA) made crucial recommendations with respect to the issuance of 'airworthiness directives' and the physical location of redundant systems,<sup>24</sup> after having conducted an exhaustive investigation.<sup>25</sup>

The investigation of a second DC-10 crash in 1979 attributed the cause in part to "improper maintenance procedures; deficiencies in the practices and communications among the operators, the manufacturer, and the regulator, noting that the U.S. Federal Aviation Administration (FAA) had failed to determine and disseminate the particulars regarding previous maintenance damage incidents."<sup>26</sup>

Ten years later, after the crash of a United Airlines DC-10 in an Iowa cornfield the NTSB determined that the failure of the aircraft's three hydraulic systems was due to the separation of a titanium alloy stage 1 fan rotor disk which was attributed to a fatigue crack resulting from an undetected alpha metallurgical defect which was formed in the titanium alloy material during manufacture of the ingot from which the disk was forged.<sup>27</sup> The NTSB called on the Federal Aviation Administration to "identify emerging technologies that [could] serve to simplify automate, or otherwise improve the reliability of the inspection process"<sup>28</sup> and repeated the BEA's 1974 call for redundant flight control systems using separate sources of power.<sup>29</sup>

The NTSB's 4-year investigation into the explosion of TWA flight 800 twelve minutes after taking off from JFK<sup>30</sup> was truly exhaustive, involving the recovery of 95% of the aircraft and its

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<sup>23</sup> In 1972, a similar failure of a cargo latch had caused rapid decompression and failure of the passenger compartment floor but the aircraft landed safely. See NTSB AAR 73-2, "Aircraft Accident Report, American Airlines Inc. McDonnell Douglas DC-10-10, N103AA, near Windsor Ontario, Canada, June 12, 1972" February 28, 1973.

<sup>24</sup> Redundant systems are equally strong back-up systems that allow an aircraft to continue to fly even if the principal system suffers critical damage. Modern aircraft have multiple levels of redundancy. See (<http://www.boeing.com/commercial/safety/whatmakes.html>).

<sup>25</sup> Journal Officiel de la République Française, le 12 mai, 1976; Edition des Documents Administratifs; Secrétariat d'État aux Transports, « Rapport Final de la Commission d'Enquête sur l'accident de l'avion D.C. 10 TC-JAV des Turkish Airlines survenue a Ermenonville, le 3 mars, 1974 », 469, 486.

<sup>26</sup> National Transportation Safety Board, Aircraft Accident Report, American Airlines, Inc. DC-10-10, N110AA, Chicago-O'Hare International Airport Chicago; Illinois May 25, 1979, Report NTSB/AAR-79-17, December 21, 1979, 69.

<sup>27</sup> National Transportation Safety Board, Aircraft Accident Report, United Airlines Flight 232, McDonnell Douglas DC-10-10, Sioux Gateway Airport, Sioux City, Iowa, July 10, 1989, Report NTSB/AAR-90-06, November 1, 1990, 102.

<sup>28</sup> *Id.*

<sup>29</sup> *Id.*

<sup>30</sup> See National Transportation Safety Board, Aircraft Accident Report, In-flight Breakup Over the Atlantic Ocean Trans World Airlines Flight 800 Boeing 747-131, N93118 Near East Moriches, New York July 17, 1996, Report NTSB/AAR-00/03, August 23, 2000.

partial reconstruction. The investigators made recommendations<sup>31</sup> that eventually caused the adoption of regulations to preclude ignition sources in airplane fuel tanks.<sup>32</sup>

However, the regulation of aviation safety is much more than learning lessons of past airplane accidents, it is also involves taking intelligent and proactive steps to avoid an accident. Thus, after the left main landing gear of a Fedex MD-10<sup>33</sup> failed during a July 2006 landing in Memphis, the NTSB conducted a four-month computer-monitored in-service evaluation of a sister aircraft. Based on the results, the NTSB subsequently conducted tests with a “detailed submodel of the area of the air filler valve”<sup>34</sup> before issuing an airworthiness directive “requiring that operators perform a video scope inspection of the air filler valve bore for the presence of stray nickel or chrome plating deposits”.<sup>35</sup>

Such investigations result in regulatory actions aimed at enhancing commercial aviation safety, but as technology advances and files become more complex, the number of nations that are able to participate in a meaningful way decreases. When Air France flight 447 disappeared off the coast of Brazil and sank to the bottom of the Atlantic Ocean in June 2009 even France was unable to conduct an investigation alone. However, the daunting prospect of having an unexplained crash involving the successful Airbus A-330<sup>36</sup> caused the French to seek the analytical, technical and logistic support of “American, Russian, German, Brazilian and British investigation organisations.”<sup>37</sup>

The fact that investigative authorities are so quick to involve colleagues from other countries means that top expertise is brought to bear in accident investigations. The resulting level of knowledge, analytical skill and subject-matter dominance is rarely if ever matched by the regulator. Further, the investigators’ final report is always published so that airlines can quickly apprise themselves of the recommendations, proposed best practices and lessons learned.<sup>38</sup>

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<sup>31</sup>Id, 309-311.

<sup>32</sup> See Special Federal Aviation Regulation (SFAR) No. 88 “Fuel Tank System Fault Tolerance Evaluation Requirements” It became effective on 6 June 2001 as per recommendations of the NTSB investigators.

<sup>33</sup> This is a modified and re-badged DC-10 with a “glass cockpit” that allows the elimination of the Flight Engineer position. FEDEX is the only operator. See, United States of America, *Congressional Record-Senate*, February 25, 2002, (Government Printing Office), 1747.

<sup>34</sup> See ([http://www.nts.gov/aviationquery/brief2.aspx?ev\\_id=20060808X01115&ntsbn=DCA06FA058&akey=1](http://www.nts.gov/aviationquery/brief2.aspx?ev_id=20060808X01115&ntsbn=DCA06FA058&akey=1)).

<sup>35</sup> Id.

<sup>36</sup> See F.P. Miller, A.F. Vandome & J. McBrewster, *Air France Flight 447* VDM Publishing House Ltd., 2010.

<sup>37</sup> Bureau d’Enquêtes et d’Analyses pour la sécurité de l’aviation civile, *Interim Report n°2 on the accident on 1st June 2009 to the Airbus A330-203 registered F-GZCP operated by Air France flight AF 447 Rio de Janeiro – Paris*, December 17, 2009, p. 9.

<sup>38</sup> Thus, the report by France BEA of the 2000 Air France Concorde crash in Paris has been translated into English. See Bureau d’Enquêtes et d’Analyses pour la sécurité de l’aviation civile, *Report of Accident on 25 July 2000 at La Patte d’Oie in Gonesse (95) to the Concorde registered F-BTSC operated by Air France*, Report f-sc000725a, (January 2002).

## 2) Bird Strikes, the Regulatory Challenge

On October 4, 1960 an Eastern Airlines Electra crashed after 3 of its 4 engines ingested a flock of starlings on take-off. Sixty-two of the aircraft's 72 occupants died and the FAA reacted by starting a research programme to improve tolerance of turbine engines to bird ingestion.<sup>39</sup>

Fifteen years later an Overseas National Airways DC-10 was forced to abort take-off from JFK when its number 3 engine disintegrated, with consequential effects on braking systems, thrust reversers and spoiler panels after ingesting a large number of seagulls.<sup>40</sup> It is a fact that a bird sanctuary is located near JFK airport<sup>41</sup> and the NTSB noted that two recent inspections had determined that birds at the airport represented a hazard to aviation<sup>42</sup> and found that the bird control system had not assured that the runway was clear of birds.<sup>43</sup> The NTSB made multiple recommendations to the Port Authority of New York and New Jersey with respect to implementing an effective bird-hazard reduction program at JFK, LaGuardia and Newark airports<sup>44</sup> and also encouraged the Port Authority to implement the recommendations contained in the previous ecological studies of Port Authority airports.<sup>45</sup>

Nonetheless the NTSB also noted the GE CF6 engines on the aircraft had not been tested in compliance with FAA Advisory Circular AC-33-1A with respect to the sizes and number of large birds to be used during ingestion tests<sup>46</sup> and they therefore made recommendations that these standards be met and further that any resulting modifications be incorporated into all newly manufactured CF6 engines.<sup>47</sup>

The U.S. regulation dealing with a jet engine's required reaction to bird ingestion is 14 CFR 33.76. Section 33.76 (1) requires the test to be run with the engine at full take-off thrust power and § 33.76 (3) details how the test must be run.

- (3) The impact to the front of the engine from the large single bird, the single largest medium bird which can enter the inlet, and the large flocking bird must be evaluated. Applicants must show that the associated components when struck under the conditions prescribed .

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<sup>39</sup> See M.N. Kalafatas, *Bird strike: the crash of the Boston Electra* (Brandeis University Press, 2010).

<sup>40</sup> IEEE Control Systems Society, "Proceedings of the 26th IEEE Conference on Decision and Control: December 9-11, 1987, Westin Century-Plaza Hotel, Los Angeles, California" (Institute of Electrical and Electronics Engineers, 1987), 1947.

<sup>41</sup> See P. Alden & J. Gooders, *Finding birds around the world* (Houghton Mifflin, 1981), 26.

<sup>42</sup> National Transportation Safety Board, Aircraft Accident Report, Overseas National Airways Inc. Douglas DC10-30 N1032F John F. Kennedy International Airport Jamaica, New York, November 12, 1975, Report NTSB-AAR-76-19, December 16, 1976, 5.

<sup>43</sup> *Id.*, 23.

<sup>44</sup> *Id.*, 25, recommendations A-76-10, A-76-11 and A-76-12.

<sup>45</sup> *Id.*, recommendation A-76-13.

<sup>46</sup> *Id.*, 22.

<sup>47</sup> *Id.*, 23, recommendations A-76-59 and A-76-60.

. . will not affect the engine to the extent that the engine cannot comply with the requirements . . . of this section.

The requirements of the section include, the non-ejection of high-energy debris, the non-contamination of air entering the cabin, an absence of thrust in any direction other than that commanded by the pilot, that the ingestion not result in inadvertent engine separation and that any resulting fire be controllable.<sup>48</sup> The requirements also mandate the maximum permissible sustained loss of power or thrust permissible after the ingestion of small and medium birds is 25%,<sup>49</sup> but that this amount increases to 50% if large birds are ingested.<sup>50</sup> Tables included with the regulation provide the number and weight of birds to be used in the test.

In any event, over a randomly chosen 64-day period between August 8 and October 11, 2010, around the world, 10 two-engine aircraft ingested birds into an engine on take-off, climb, approach or landing and landed safely, as the following table<sup>51</sup> shows.

**Bird-strikes by two-engine commercial airliners August 8 and October 11, 2010**

Date	Carrier	Plane	Comments
Oct-11	Hawaiian	B763	bird remains discovered in engine on landing.
Oct-09	Easyjet	A319	ingests bird into #2 engine on final approach.
Oct-05	Air Canada	A321	smoke from engine after bird strike on take-off.
Sep-22	Ukrainian Med.	DC-9-50	experiences bird strike to #1 engine on climb.
Sep-15	Delta	B763	experience bird strike to engine on climb.
Sep-08	Croatia	A320	ingested birds into #2 engine on take-off.
Aug-28	Indigo	A320	ingested bird into #1 engine on take-off.
Aug-18	Air New Zealand	B737	ingested bird into #2 engine after take-off.
Aug-11	GOL Transportes	B73W	ingested bird into engine on approach.
Aug-08	Alaska Airlines	B734	ingested eagle into engine on take-off.

Initially, the results seem to suggest U.S. engine builders have in each case respected both the spirit and letter of 14 CFR 33.76 was respected. None of the engines disintegrated, caused contamination of the cabin or produced thrust in a direction other than that which the captain commanded. Moreover, in the case of the Hawaiian B763, the crew was not even aware that the engine had ingested a bird until after the aircraft had completed a 4,120 Km flight.<sup>52</sup> In a second

<sup>48</sup> 14 CFR §33.75(g)(2).

<sup>49</sup> 14 CFR §33.76(c)(6).

<sup>50</sup> 14 CFR §33.76(d)(4).

<sup>51</sup> Data taken from (<http://www.detect-inc.com/birdstrikes.htm>).

<sup>52</sup> See (<http://avherald.com/h?article=43223d6c>).



case the crew of a Delta B763 was not aware that the engine had ingested a bird until the engine began vibrating roughly two hours after the impact.<sup>53</sup>

However, the Indigo A320 left small engine parts on the runway after its #1 engine ingested the bird on take-off,<sup>54</sup> and an Alaska Airlines B734 had to abort take-off after one of its engines shut down completely after ingesting an eagle.<sup>55</sup>

The four incidents chosen from this micro-sample serve to confirm the obvious; a jet engine's ability to react to the ingestion of a bird, will be a function of the size of the engine, the size of the bird, the location of the impact, and the speed at which the engine is operating when the impact occurs. Thus it is not surprising that the two aircraft which did not notice the initial impact were B763s with engines such as the Pratt & Whitney P400 with its impressive 94 inch diameter and a thrust ranging from 52,000 to 62,000 pounds.<sup>56</sup> Similarly the engine which shut down after ingesting an eagle was a much smaller CFM 56-3<sup>57</sup> with a 60 inch diameter and roughly 23,000 pounds of thrust<sup>58</sup> and given the size of the bird, the engine was completely destroyed by the impact.<sup>59</sup>

Many are aware of the well-publicized "Miracle on the Hudson" in which the crew of a US Airways A-320 successfully ditched the aircraft in the Hudson River after both of its CFM-56 engines ingested large birds on take-off from New York's LaGuardia Airport on Jan 15, 2009.<sup>60</sup> However, it is much less widely known that similar incidents occurred six months and two months earlier in Bulgaria<sup>61</sup> and Italy respectively,<sup>62</sup> and again in Italy nine months later.<sup>63</sup>

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<sup>53</sup> See (<http://avherald.com/h?article=4310b786>).

<sup>54</sup> See (<http://avherald.com/h?article=43031788&opt=0>).

<sup>55</sup> See(<http://abcnews.go.com/Business/wireStory?id=11353712>).

<sup>56</sup> See generally, B. Gunston, *World Encyclopedia of Aero Engines: From the Pioneers to the Present Day* (Sutton, 2006).

<sup>57</sup> Delta will be maintaining Alaska's CFM 65 engines. See (<http://news.delta.com/index.php?s=43&item=482>).

<sup>58</sup> See generally, B. Gunston, *World Encyclopedia of Aero Engines: From the Pioneers to the Present Day* (Sutton, 2006).

<sup>59</sup> See (<http://www.adn.com/2010/08/09/1402592/pilot-saw-eagle-coming-before.html>).

<sup>60</sup> The fact that the crew of US 1549 succeeded in safely landing a powerless airline on the Hudson River with no loss of life provoked national interest, including a report by Congress. See, U.S.C.H. Represen, *US Airways Flight 1549 Accident* (Bibliogov, 2010).

<sup>61</sup> On August 3, 2008 a BH Air A320 ingested a number of birds into both of its CFM56-5A3 engines upon take-off from Bourgas, Bulgaria. The crew was able to safely conduct an overweight landing at the airport. The incident was investigated by the Bulgarian Aircraft Accident Investigation Unit. See (<http://avherald.com/h?article=41f1972e>).

<sup>62</sup> On November 10, 2008 a brand-new Ryanair 737-800 may have ingested multiple birds into each engine upon landing at Rome's Ciampino aircraft. Such damage was done to the aircraft that it was written off. See (<http://avherald.com/h?article=40fc7579&opt=0>) and (<http://aviation-safety.net/database/record.php?id=20081110-0>).

<sup>63</sup> On October 3, 2009 A Ryanair B738 ingested birds into both engines on take-off from Trapani airport in Sicily. The aircraft was able to land safely and Italian authorities launched an investigation. See (<http://avherald.com/h?article=420a0c73>).

The National Transportation Safety Board's investigation into the U.S. Airways incident<sup>64</sup> was adopted on May 4, 2010 and thus it is highly probable that investigators were aware of the 3 other incidents. In its report, the NTSB noted the flight had encountered birds at an altitude beyond the control of an airport, and thus explored the Bird-Ingestion Certification Requirements<sup>65</sup> before recommending that new regulations impose higher standards.<sup>66</sup>

The large flocking bird test mandated by 14 CFR 33.76(d) requires a jet engine to continue to produce 50% of maximum take-off thrust after ingesting a 4 lb bird.<sup>67</sup> Where previously the CFM-56 engines, which are designed for smaller transport-category airplanes, have been exempt<sup>68</sup> the potential new rules might apply to them.<sup>69</sup>

Dr. John Downer of the London School of Economics' Centre for Analysis of Risk and Regulation argues that such tests in support of such standards are inherently complex and a victim of subjective judgements.<sup>70</sup> He writes:

“System engineers, materials scientists, statisticians and ornithologists, all must collaborate to form judgements based on compromises, best guesses and interpretations of limited evidence. There are no objective or definitive answers.”<sup>71</sup>

However, he goes substantially further and actually questions the regulator's expertise in making such regulations:

“The complexity of modern aircraft has long passed a level where regulating it is within the FAA's budget and manpower, and yet the FAA would be ill-placed to make informed judgements even with infinite resources; they simply lack the ‘technical intimacy’ to make the requisite judgements about the technologies they certify.”<sup>72</sup>

### **3) Regulatory Expertise in Question**

Such allegations should not come as a complete surprise; nearly two decades ago, it became known that the Federal Aviation Administration did not have the resources to assure the airworthiness of U.S. registered aircraft.<sup>73</sup> However this type of problem has existed for years

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<sup>64</sup> National Transportation Safety Board, Aircraft Accident Report, Loss of Thrust in Both Engines After Encountering a Flock of Birds and Subsequent Ditching on the Hudson River US Airways Flight 1549 Airbus A320-214, N106US, Weehawken, New Jersey, January 15, 2009, Report NTSB/AAR-10-03, May 4, 2010.

<sup>65</sup> *Id.*, 16-19.

<sup>66</sup> *Id.*, 124, recommendations A-10-64 and A-10-65.

<sup>67</sup> *Id.*, 19.

<sup>68</sup> *Ibid.*, 19. See footnote 41 of the report.

<sup>69</sup> *Ibid.*, 124, recommendation A-10-65.

<sup>70</sup> J. Downer, *Watching the watchmaker: on regulating the social in lieu of the technical* (CARR., 2009), 3-4.

<sup>71</sup> *Ibid.*, 5.

<sup>72</sup> *Ibid.*, 5-6.

<sup>73</sup> See GAO, *Aviation Safety: Unresolved Issues Involving U.S.-Registered Aircraft*, GAO/RCED-93-135, 6 (1993).

and its role in the certification of the DC-10<sup>74</sup> may explain some of the safety issues related to that aircraft.<sup>75</sup>

The FAA acknowledges that it has neither the manpower nor, in some instances, the specialized expertise to inspect every one of the thousands of parts and systems that go to make up a modern airliner. It therefore appoints at every plant, designated engineering representatives (DERs) - company men, paid by the manufacturer, who spend part of their working lives wearing, as it were, an FAA hat. Their job during the certification process is to carry out "conformity inspections" of the plane's bits and pieces to ensure that they comply with Federal Airworthiness Regulations.<sup>76</sup>

In 1984, the U.S. Supreme Court noted the FAA's practices in aircraft certification:

The FAA certification process is founded upon a relatively simple notion: the duty to ensure that an aircraft conforms to FAA safety regulations lies with the manufacturer and operator, while the FAA retains the responsibility for policing compliance. Thus, the manufacturer is required to develop the plans and specifications and perform the inspections and tests necessary to establish that an aircraft design comports with the applicable regulations; the FAA then reviews the data for conformity purposes by conducting a "spot check" of the manufacturer's work."<sup>77</sup>

Here the U.S. Supreme Court is confirming what has long been suspected; even in the U.S. there is a growing lack of regulatory technical expertise and therefore the regulator is increasingly relying upon the regulatee, in this case the aircraft manufacturer, to ensure compliance with regulatory standards. Here rather than the regulator making an unannounced plant or site visit to conduct a thorough inspection, the regulator examines "compliance" documents prepared by the regulatee, to demonstrate that processes have been followed.

Instead of inspecting the manufacturing process, the regulator now revises documents, a task that requires considerably less technical expertise. Under this scenario, the regulatee self-inspects and submits reports to the regulator to confirm that the regulatee has followed the rules. However, unless the regulator has the technical ability to second-guess the report, he must rely entirely on the honesty and professionalism of the regulatee.

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<sup>74</sup> The DC-10 was certified by the FAA on July 29, 1971.

<sup>75</sup> See Fielder, J.H. & Birsch, D., *The DC-10 case: a study in applied ethics, technology, and society* (State University of New York Press, 1992).

<sup>76</sup> *Ibid*, 88.

<sup>77</sup> *U.S. v. Varig Airlines* 18 Avi 17,960 U.S. Supreme Court. 1984, 17,966.

#### 4) Safety Management Systems

The idea of “documenting compliance” is at the centre of Safety Management Systems (SMS). In support of government legislation<sup>78</sup> to implement SMS in Canada, Merlin Preuss, the Director General of Civil Aviation for Transport Canada testified:

“Regulating smarter is a phrase that is often used and involves continually improving regulations, better managing the regulatory process, and recognizing the shared responsibility of governments, citizens, and industry in making the system more effective.”<sup>79</sup>

“In a safety management systems environment, the role of inspectors becomes even more important, in that intervention is at the systems level *rather than at the operational level* [author’s emphasis]. This means that systems put in place to ensure personnel competency, sound maintenance and engineering, and safe operations will be subject to assessment and validation, and the consequences of systems failures will be more dramatic and will potentially result in suspension of the operating certificates.”<sup>80</sup>

Nonetheless, a 2001 Transport Canada internal document identified SMS as a means to “reduce regulatory burden .[and] . . oversight requirements.”<sup>81</sup>

The Hon. Judge Virgil A. Moshansky<sup>82</sup> was unaware of the Transport Canada internal report and yet he described SMS this way:

“Regulatory oversight is not being merely reduced. Except for limited focused audits, it is being systematically dismantled under [the proposed legislation]. All of this is occurring in the face of a predicted doubling of the size of the aviation industry by 2015, as per Transport Canada's own estimates.”<sup>83</sup>

Thus Judge Moshansky confirms that Canada was following the American lead; the regulator will monitor the paperwork that confirms that the regulatee has complied with the regulations.

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<sup>78</sup> Bill C-6 *An Act to amend the Aeronautics Act and to make consequential amendments to other Acts*, was first read on April 27<sup>th</sup>, 2006, in the 1<sup>st</sup> Session of the 39<sup>th</sup> Parliament. It was not adopted and similar attempts in the 38<sup>th</sup> Parliament (C-62) and in the 2<sup>nd</sup> Session of the 39<sup>th</sup> Parliament C-7) also failed.

<sup>79</sup> Standing Committee on Transport, Infrastructure and Communities, 39<sup>th</sup> Parliament, 1<sup>st</sup> Session, February 12, 2007 TRAN, Number 034, *Evidence*, p. 1 (Statement of Merlin Preuss).

<sup>80</sup> *Id.*, 2.

<sup>81</sup> Transport Canada Civil Aviation Directorate PowerPoint presentation “2001/2002 Service Line Plan and Resource Options” (Transport Canada, Ottawa October 22, 2001) at 26.

<sup>82</sup> Virgil P. Moshansky, C.M., Q.C., LL.B. investigated the Air Ontario F-28 accident at Dryden on March 29, 1989. He is a member of Order of Canada. See (<http://www.gg.ca/honour.aspx?id=4087&t=12&ln=Moshansky>).

<sup>83</sup> Standing Committee on Transport, Infrastructure and Communities, 39<sup>th</sup> Parliament, 1<sup>st</sup> Session, February 28, 2007 TRAN, Number 039, *Evidence*, p. 1 (Statement of the Hon. Virgil P. Moshansky).

Indeed, ICAO's standards require nothing less:

- 3.3.3 States shall require, as part of their State safety programme, that an operator implement a safety management system acceptable to the State of the Operator that, as a minimum:
- a) identifies safety hazards;
  - b) ensures the implementation of remedial action necessary to maintain agreed safety performance;
  - c) provides for continuous monitoring and regular assessment of the safety performance; and
  - d) aims at a continuous improvement of the overall performance of the safety management system.<sup>84</sup>

Here the burden of ensuring compliance with the standards has shifted to the regulatee, and this could be seen as ICAO's acknowledgment of a declining level of regulatory expertise.

## **5) Reacting to Regulatory Failure**

Regulatory failure will occur when there is no regulator to regulate, or when the regulator is less vigilant and/or competent than the regulatee.

### ***a) The absence of regulation***

Fortunately the concerns of airlines and aircraft manufacturers about safety predate the existence of the regulator; for example, in 1933, fully eight years before the U.S. Civil Aeronautics Authority<sup>85</sup> was created, the launch of Boeing's 247 demonstrated that the private sector acting on its own had the capability to dramatically improve aviation safety. The aircraft was equipped with the following previously unknown safety measures: an enclosed cockpit; a co-pilot; a primitive auto-pilot system; two-way radio; moveable wing flaps; retractable landing gear; non-skid tires; all-metal construction; and the ability to climb on just one engine.<sup>86</sup>

Similarly on May 7, 1937, seven years before the *Chicago Convention*, the manager of the Luftschiffbau Zeppelin company ordered the *Graf Zeppelin* grounded immediately after arriving in Frankfurt, because of the crash of its sister ship the *Hindenburg* in Lakehurst, New Jersey earlier that day.<sup>87</sup>

Fifteen years later Canadian Pacific Airlines (C.P.A.) faced an equally difficult decision with the de Havilland Comet, the world's first passenger jet. The airline had ordered the jets in 1949 and saw its first aircraft CF-CUN crash on the delivery flight in March 1953<sup>88</sup> and a second jet flown

<sup>84</sup> S. 3.3.3 Annex 6 to the Convention on International Civil Aviation, Operation of Aircraft, Part I International Commercial Air Transport — Aeroplanes, Ninth Edition July 2010, International Civil Aviation Organization, 2010.

<sup>85</sup> See *The Civil Aeronautics Act of 1938* (CAA) (PL 75-706, 52 Stat. 973).

<sup>86</sup> See generally, Linden, F.R.V., National Air & Space Museum, *The Boeing 247: the first modern airliner* Published for the National Air and Space Museum by the University of Washington Press, 1991)

<sup>87</sup> See Jill Sherman, *The Hindenburg Disaster* (Abdo Group 2010): 73-74.

<sup>88</sup> Pigott, P., *Taming the skies: a celebration of Canadian flight* (Dundurn Press, 2003): 135-136.

by BOAC crash two months later. C.P.A.'s crash marked the world's first passenger jet fatality,<sup>89</sup> and the airline quickly cancelled the delivery of another Comet.<sup>90</sup>

Given that the public will not knowingly fly in unsafe aircraft, the industry's concern for safety is understandable and by necessity, is not dependent on the existence or competence of the regulator.

***b) Regulatee has higher standards than the regulator***

Even where competent regulation exists, it is not uncommon to see these standards significantly exceeded. Quite simply, the same preoccupation with safety that drives the industry to adopt practices and technology in the absence of standards also motivates them to be even more vigilant than the regulator. Thus the British Overseas Aircraft Corporation (BOAC) withdrew its accident-prone de Havilland Comets from service 4 days before the regulator ordered it.<sup>91</sup>

Similarly, as late as May 1962 Continental Airlines could boast of a perfect safety record that it had held since 1937 due in part because Continental had "devised the progressive maintenance system, which was copied by the entire industry."<sup>92</sup>

More recently, Aeroflot, eager to improve its reputation with European and North American passengers, replaced most of its former Soviet-built fleet with new Bermudan-registered Airbus and Boeing jets.<sup>93</sup> The jets are owned by European and North American leasing companies and are maintained according to their standards; in 1995-1996 air crashes in the former Soviet Union claimed 200 lives but Aeroflot was crash-free.<sup>94</sup>

In the developing world, where aviation regulatory expertise may not meet international standards, commercial carriers are often quick to adopt the safety measures required for international commercial operations and therefore European authorities were able to conclude:

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<sup>89</sup> See (<http://aviation-safety.net/database/record.php?id=19530303-1>)

<sup>90</sup> Pigott, P., *Taming the skies: a celebration of Canadian flight* (Dundurn Press, 2003): 136. A sister aircraft CF-CUM, due for delivery in August 1953 was never taken up; it went to BOAC.

<sup>91</sup> See P. A. Whitney, "Fatigue Failure of the De Havilland Comet 1." in D. R. H. Jones, *Failure analysis case studies 2*. (Pergamon 2001): 185-192, 185. (BOAC pulled the Comets out of service on April 8, 1954 after 2 Comets; G-ALYP and G-ALYP, had crashed on Jan 8 and April 8 respectively. The U.K. Ministry of Transport and Civil Aviation removed the aircraft's Certificate of Airworthiness on April 12, 1954.

<sup>92</sup> R.E.G. Davies, *Rebels and Reformers of the Airways* (Shrewsbury, England.: Airline Publishing, 1987) 39.

<sup>93</sup> This started in the mid-1980s; see Bureau of National Affairs, BNA's Eastern Europe reporter (Bureau of National Affairs, 1997): 357.

<sup>94</sup> See "Nowhere to Go but Up." *The Economist*, December 14, 1996, p. 64 and "On a Wing and a Prayer," *The Economist*, October 5, 1996, p. 65.

“Albanian Airlines and Belle Air are operating in accordance with the relevant safety standards and indeed taking additional measures to ensure their own safety oversight given the recognised deficiencies of the national civil aviation authorities [of Albania].”<sup>95</sup>

## **6) Regulatory Failure provokes Regulator Shopping**

However, the problem becomes more complex in cases of complete regulatory failure as is confirmed when European Authorities decide to ban from European Airspace, “all air carriers certified by the authorities with responsibility for regulatory oversight of [X]”<sup>96</sup> and where “X” is the name of a State. The FAA’s International Aviation Safety Assessments (IASA) Program<sup>97</sup> also bans airlines and thus there are at present over 25 States whose carriers are banned by one or both of the EU or the U.S. The list is contained in Appendix I, Countries whose Airlines are Banned from EU Skies.

In July 2009 the European authorities were set to ban from European skies “All air carriers certified by the authorities with responsibility for regulatory oversight of Kazakhstan”<sup>98</sup> after having detected a “verified evidence of lack of ability of the authority responsible for the safety oversight of air carriers certified in Kazakhstan to implement and enforce the relevant safety standards”<sup>99</sup> and having concluded, “the competent authorities of Kazakhstan are, at this stage, not able to implement and enforce the relevant safety standards on all air carriers under their regulatory control. Therefore, all air carriers certified in Kazakhstan should be subject to an operating ban.”<sup>100</sup>

The management of Kazakhstani-based Air Astana reacted quickly. The carrier is a Joint Stock Company, 51% owned by Samruk-Kazyna of Kazakhstan and 49% owned by BAE systems of the U.K.<sup>101</sup> Airline management quickly informed European regulators that that the carrier’s very modern fleet is registered in Aruba and that regulatory oversight for the fleet is conducted by the Aruba Department of Civil Aviation.<sup>102</sup>

Moreover, because the airlines is “EASA (European Aviation Safety Agency) Part 145 certified to perform aircraft maintenance”<sup>103</sup> and provides these service to many airlines serving

<sup>95</sup> See Regulation (EC) No 787/2007 amending Commission Regulation (EC) No 474/2006 establishing the Community list of air carriers which are subject to an operating ban within the Community, 2007 O.J. (L 175) 10 at 12.

<sup>96</sup> Id at 24.

<sup>97</sup> This is authorized pursuant to 14 CFR Part 129. See also (<http://www.faa.gov/about/initiatives/iasa/>).

<sup>98</sup> See Regulation (EC) No 619/2009 amending Commission Regulation (EC) No 474/2006 establishing the Community list of air carriers which are subject to an operating ban within the Community, 2009 O.J. (L 182) 4 at 20.

<sup>99</sup> Ibid at 7.

<sup>100</sup> Ibid at 8.

<sup>101</sup> Air Astana, *Annual Report 2009* (2009) 7.

<sup>102</sup> Id. 19.

<sup>103</sup> Air Astana, *Annual Report 2009* (2009) 7.

Kazakhstan, including KLM Royal Dutch Airlines, Turkish Airlines, Czech Airlines and Etihad, Air Astana is audited twice a year by the UK Civil Aviation Authority.<sup>104</sup>

The European authorities exempted Air Astana from an outright ban noting the “competent authority of Aruba is responsible for the oversight of the aircraft on the fleet of Air Astana in accordance with the provisions of *Annexes 1, and 8* to the *Chicago Convention* as well as *Annex 6* for continuing airworthiness aspects.”<sup>105</sup>

The fact that Kazakhstani-based Air Astana was spared is due in part to the carrier’s “unique regulatory framework”<sup>106</sup> which was the result of various strategies the company implemented in order not be subject to the regulation of Kazakhstani aviation authorities; and this is a clear case of ‘regulator shopping.’

In 2000, BAE managers sent to help start-up the carrier found “a history of failed airlines, poor safety records . . . and the remnants of the former Soviet regulatory set-up, all of which were totally unsuited . . . .”<sup>107</sup>

The managers predictably set up a system that would require twice-yearly audits by the UK Civil Aviation Authority, and presumably aware of the reputation of the Aruba Department of Civil Aviation,<sup>108</sup> ensured that the fleet was registered there.<sup>109</sup> In so doing Air Astana’s management chose to be regulated by authorities in Aruba and the United Kingdom rather than by those in Kazakhstan.

In retrospect Air Astana’s choices appear to have been wise but it is not the first carrier to have gone regulator shopping; TACA of El Salvador initiated the practice in the 1980s. By 1987, when El Salvador was involved in a civil war, the carrier was flying four U.S.-registered Boeing jets and its fleet is still U.S.-registered today.<sup>110</sup> Indeed, in order to maintain its U.S.-registered fleet in El Salvador, the carrier convinced American authorities to certify its former maintenance base in 1992.<sup>111</sup>

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<sup>104</sup> Id, 10.

<sup>105</sup> See Regulation (EC) No 619/2009 amending Commission Regulation (EC) No 474/2006 establishing the Community list of air carriers which are subject to an operating ban within the Community, 2000 O.J. (L 182) 4 at 8.

<sup>106</sup> Air Astana, *Annual Report 2009* (2009) 10.

<sup>107</sup> Barry Woods-Turner, “The 21st Century Silk Road” *Airliner World*, December 2010, 46

<sup>108</sup> The FAA has found the Aruba Department of Civil Aviation to be in full compliance with international aviation standards for oversight of Aruba’s air carrier operations. See Usa, I. & U.S.A.C.O.R.I.B. Publications, *Aruba Taxation Laws and Regulations Handbook* (International Business Publications, USA, 2008) 185.

<sup>109</sup> Kazakhstan is one of a half dozen countries who allow domestic airlines to register their fleets in other countries. The others include El Salvador, the Russian Federation and Uzbekistan. See P. Paul Fitzgerald, “In Defense of the Nationality of Aircraft” (forthcoming) (2011) 36 Ann. Air & Space L

<sup>110</sup> *Ibid.*

<sup>111</sup> Aeroman was established by TACA in 1983 and got FAA certification in 1992. See (<http://www.aeroman.com.sv/en-company.jsp?idCat=5>).



Regulator Shopping is common in other industries such as Finance, where it is routine:

“Ex-Im Bank<sup>112</sup> officials . . . frequently [create] Cayman Islands entities to facilitate the purchase of U.S. aircraft, and these deals often involve foreign entities who may prefer not to carry out business in the United States for tax,<sup>113</sup> regulatory, or political reasons.”<sup>114</sup>

However, airlines must typically be based in a State’s territory in order to be designated to operate international routes pursuant to that State’s bilateral air agreements<sup>115</sup> and thus regulator shopping by airlines is both extremely rare, and legally complex. For this reason, when it occurs it can constitute a very bold statement on the qualities of local regulatory authorities.

## **7) Tort Liability as a Regulatory Instrument**

*Ex post* liability for harm can be seen as an alternative to *ex ante* regulation<sup>116</sup> and together form a dual-track system<sup>117</sup> in terms of ensuring aviation safety. Thus where the regulatory requirement had addressed the risk, and where the defendant had fully complied with requirements and had informed regulator with respect to risks associated with its products and processes, the defendant might be exonerated.<sup>118</sup>

Just as complete regulatory compliance might absolve a defendant, *Ex post* Tort Liability could replace *ex ante* regulation in a scenario where:

1. All tortfeasors face similar financial constraints;
2. Legal action against a tortfeasor is certain; and
3. The magnitude of liability is calculated in an optimal way.<sup>119</sup>

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<sup>112</sup> Ex-Im Bank is a U.S. federal government institution; see 12 U.S.C. § 635.

<sup>113</sup> The EU is also very concerned about offshore financial centres as a means of tax avoidance. See Council Directive 2003/48/EC of 3 June 2003 on taxation of savings income in the form of interest payments 2003 O.J. (L157) 38.

<sup>114</sup> See GAO, Cayman Islands; Business and Tax Advantages Attract U.S. Persons and Enforcement Challenges Exist, GAO-08-778 (July 2008): 28.

<sup>115</sup> Thus when Cubana de Aviación S.A wanted to operate its routes to Canada with aircraft wet-leased from TACA airlines of El Salvador, they had to seek permission from the Canadian government. See CTA Decision No. 609-A-2008, December 8, 2008.

<sup>116</sup> See Schmitz, Patrick W., “On the joint use of liability and safety regulation” (2000) 20:3 International Review of Law and Economics, 371.

<sup>117</sup> Stewart, Richard B. "Regulatory Compliance Preclusion of Tort Liability: Limiting the Dual-Track System" 88 Geo. L.J. 2167 (1999-2000) 2167, 2169

<sup>118</sup> Ibid, 2170-2172.

<sup>119</sup> See Schmitz, Patrick W., “On the joint use of liability and safety regulation” (2000) 20:3 International Review of Law and Economics, 371 at 372

Each of the above factors are essential as they collectively allow a tortfeasor to conduct a risk analysis measuring both the cost of meeting an appropriate standard of care and the financial cost associated with failure to meet that same standard.

Indeed in the Ford Pinto case<sup>120</sup> Courts heard that Ford had calculated its potential legal liabilities at \$49.5 million as compared to a cost of \$137 million to meet a not-yet proclaimed National Highway Transportation System Bureau standard for fuel system integrity.<sup>121</sup>

In considering the matter, Tamura, Acting P. J. of the California Court of Appeal wrote:

“A reasonable inference may be drawn from the evidence that despite management's knowledge that the Pinto's fuel system could be made safe at a cost of but \$4 to \$8 per car, it decided to defer corrective measures to save money and enhance profits.”<sup>122</sup>

“Ford's management decided to proceed with the production of the Pinto with knowledge of test results revealing design defects which rendered the fuel tank extremely vulnerable on rear impact at low speeds and endangered the safety and lives of the occupants. Such conduct constitutes corporate malice.”<sup>123</sup>

If such calculations of cost-benefit analysis are troubling, it is comforting to note that for the aviation industry, in addition to the Tort Liability that accompanies any misfeasance, there is also potential significant reputational damage.<sup>124</sup> For example after a major DC-10 crash in 1979, the second crash of that aircraft type in five years; the FAA temporarily withdrew the aircraft's type certificate before recognizing that the aircraft's design was not a factor in the second accident<sup>125</sup> and the negative publicity associated both with this action and the two previous accidents<sup>126</sup> eroded sales of the aircraft.<sup>127</sup>

Thus, any cost-benefit analysis conducted by an airline in order to determine what standard of care to meet will not only calculate the financial impact of liability for Tort, but also the economic impact of the reputational damage associated with the same Tort. Moreover, given the strict liability regimes that apply to so many aspects of the commercial aviation industry, the three conditions above are met; aircraft manufacturers and airlines have similar ‘deep-pocket’

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<sup>120</sup> *Grimshaw v. Ford Motor Co.* (1981) 119 CA3d 757

<sup>121</sup> See Gary T. Schwartz, “The Myth of the Ford Pinto Case” (1990-1991) 43 Rutgers L. Rev. 1013 at 1018-1020. Schwartz point out at p. 124 that the NTSB used similar cost-benefit analysis.

<sup>122</sup> *Grimshaw v. Ford Motor Co.* (1981) 119 CA3d 757 at 790

<sup>123</sup> *Grimshaw v. Ford Motor Co.* (1981) 119 CA3d 757 at 814

<sup>124</sup> See *infra*, section 8 a) Airlines Policing Themselves

<sup>125</sup> See Francillon, R.J., *McDonnell Douglas aircraft since 1920* (Naval Institute Press, 1990) 294.

<sup>126</sup> *Ibid*, 293.

<sup>127</sup> *Ibid*, 280.

insurance policies; legal actions against them are facilitated by strict liability regimes and liability is determined through settlement or through the trial process.

**a) Product Liability**

In 1978 a Continental Airlines DC-10 burst two tires during take-off attempt at Los Angeles and aborted take-off, causing the aircraft to over-run the runway, ripping the left landing gear from the wing and starting a fire which consumed the aircraft and killed two passengers.<sup>128</sup>

At the time the applicable regulations required that the main landing gear system be designed so that if it failed due to overloads during takeoff or landing the failure would not be likely to puncture any part of the fuel system in the fuselage.<sup>129</sup> However, during the accident, the fuselage, although severely burned had remained intact;<sup>130</sup> the fire had started after the “left landing gear attachment structure failed and caused the left wing fuel tank to rupture.”<sup>131</sup>

Thus, even though the aircraft had complied with federal regulations at all times through the accident, the airline sued the manufacturer because the aircraft had not performed as advertised.

In *Continental Airlines, Inc. v. McDonnell Douglas*<sup>132</sup> the California Court of Appeal held that Continental Airlines could rely on representations made by McDonnell Douglas’ sales team:

“Douglas was, at the least, reckless in making representations to Continental, in its sales brochures and briefings, that the landing gear was designed to break away without rupturing the wing fuel tanks. Certainly Douglas’s sales representatives should have known whether a particular feature of the aircraft Douglas was promoting with such vigor was already designed or was still being designed (so that its performance was yet uncertain.)”<sup>133</sup>

Because of the size of the contract,<sup>134</sup> it was negotiated between the parties, and in Article 12 of the purchase agreement Continental had waived its right to make a claim for negligence.

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<sup>128</sup> The plane was headed for Honolulu and was carrying 14 crew and 186 passengers. See, National Transportation Safety Board, Aircraft Accident Report, Continental Air Lines, Inc. McDonnell-Douglas DC-10-10, N68045, Los Angeles, California, March 1, 1978, Report NTSB/AAR-79-01, January 25, 1979.

<sup>129</sup> See, 14 CFR 25.721 (d) as it was in 1971 when the DC-10 was certified.

<sup>130</sup> See, National Transportation Safety Board, Aircraft Accident Report, Continental Air Lines, Inc. McDonnell-Douglas DC-10-10, N68045, Los Angeles, California, March 1, 1978, Report NTSB/AAR-79-01, January 25, 1979. 12

<sup>131</sup> *Id.*, 41.

<sup>132</sup> 216 Cal.App.3d 388 (1989), 264 Cal. Rptr. 779.

<sup>133</sup> *Id.*, 800.

<sup>134</sup> Continental had ordered 8 DC-10-10's and 8 DC-10-10CF's. See Andy Hofton, “Commercial Aircraft of the World”, FLIGHT INTERNATIONAL, 23 October 1975, 609-638, 636. Each aircraft was worth \$17-18 million.

Nonetheless, the Court held that “negligent misrepresentation is a form of ‘actual fraud’”<sup>135</sup> and awarded Continental Airlines \$17 million plus interest.<sup>136</sup>

In another case, *Khasanov Faat Fatkhiboyanovich and Khasonova Zalia Sharifovna et al. v. Honeywell et al.*,<sup>137</sup> dealing with the tragic mid-air crash over Überlingen, Germany in July 2002, a Spanish court found that the manufacturer of the Traffic Alert and Collision Avoidance System (TCAS)<sup>138</sup> on the two aircraft had failed to warn pilots to follow the TCAS instructions instead of those of the Air Traffic Controller (ATC), in the event of potential mid-air collisions and awarded families of the victims \$14 million.

Supporting the plaintiffs’ case was the fact that the accident investigators had, within 4 months of the accident, called on the International Civil Aviation Organization (ICAO) to make this change<sup>139</sup> and it took the regulator over 5 years to comply<sup>140</sup> and even then, certain technical issues remained unresolved.<sup>141</sup>

Similarly in the aftermath of the 1996 explosion of TWA flight 800 over the Atlantic Ocean 13 km from the coast of East Moriches, N.Y., legal avenues were being pursued before the NTSB report was completed.<sup>142</sup> Courts were asked to grant relief to the victims’ families against the airline, the aircraft manufacturer and the manufacturer of the fuel pump on board for allowing the conditions that made possible an explosion in the plane’s center fuel tank.<sup>143</sup>

More recently, in 2003, families of 28 victims of a very serious crash in Indonesia settled a claim filed in Chicago against the aircraft manufacturer and the maker of the aircraft’s ground-

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<sup>135</sup> 216 Cal.App.3d 388 (1989), 264 Cal. Rptr. 779, 786.

<sup>136</sup> Amazingly, this was the second problem that Continental had experienced with the DC-10. In 1972, the #2 engine of its first DC-10 had disintegrated during a training flight. See, National Transportation Safety Board, *Aircraft Incident Report, Continental Airlines, Inc. McDonnell Douglas DC-10, N68041, Tucson, Arizona, May 2, 1972*, Report NTSB-AAR-72-29, October 18, 1972.

<sup>137</sup> Case no.: 424/2007-1D, Spain 2009.

<sup>138</sup> It is also known as Airborne Collision Avoidance System (ACAS) in Europe.

<sup>139</sup> See, German Federal Bureau of Aircraft Accidents Investigation, *Investigation Report*, Report AX001-1-2/02, May 2004, 111. Initial recommendations were made in October 2002, barely 4 months after the accident.

<sup>140</sup> ICAO’s amendments became effective November 22, 2007. See ICAO, Doc 8168-OPS/611, Volume I, Amendment No. 2. See also ICAO Doc 4444, ATM 501, *Air Traffic Management; Procedure for Air Navigation Services*, Fifteenth Edition - 2007, ICAO 2007, Section 15.7.3 “Procedures in regard to aircraft equipped with airborne collision avoidance systems (ACAS).” See further, Stanislaw Drozdowski, “Changes to ICAO Rules Regarding TCAS RAS” *Hindsight No 6*, January 2008, Eurocontrol, Brussels, 2008, 14.

<sup>141</sup> See G.A. Boy, *The Handbook of Human-Machine Interaction: A Human-Centered Design Approach* (Ashgate Pub Co, 2011), 140.

<sup>142</sup> The NTSB report was issued on August 23, 2000, but NY courts were hearing cases related to the accident as early as 1996.

<sup>143</sup> By July 1997 given that the grounds of the plaintiffs’ claims were fairly strong, the defendants sought to limit claims for loss of society, survivor’s grief, pre-death pain and suffering, and punitive damages, by arguing that the *Death on the High Seas Act*, 46 U.S.C. app. 761-767, applied. The Courts held that it does not apply within the 20 nautical mile Coastal Zone. See *In re Air Crash off Long Island, New York, on July 17, 1996*, 27 F. Supp. 2d 431, 433 (S.D.N.Y. 1998), affirmed, *In re Air Crash off Long Island* (2d Cir. 2000), Docket No. 98-9622, March 29, 2000.

proximity warning system.<sup>144</sup> The airline had been quick to settle with the victim's families,<sup>145</sup> but the crash undoubtedly contributed to the airline's inclusion on the list of airlines banned by the EU in July 2007.<sup>146</sup>

### **b) Airline's Legal Liability to Passengers**

The product liability regime that allows airlines to recover from aircraft manufacturers is similar in many ways to the no-fault or strict liability regime that applies to international aviation as a result of the *Warsaw Convention*<sup>147</sup> or any of its successor agreements<sup>148</sup> up to and including the *Montreal Convention (1999)*.<sup>149</sup> These conventions facilitate passenger actions against airlines for injury/death, loss or damage to baggage or delay of passenger and/or baggage, and have been seen by some as opening up avenues for foreign plaintiffs to bring action before U.S. courts.<sup>150</sup> Because of the extensive case law,<sup>151</sup> fewer Court decisions are reported than in the past,<sup>152</sup> but high profile claims are still publicly announced<sup>153</sup> even if they are later quietly settled.<sup>154</sup>

<sup>144</sup> The victims received nearly \$500,000 each. See Gary Webb, "Garuda crash lawsuit finally settled" *Asia Times Online*, Sep 25, 2003 (<http://www.wisner-law.com/articles/garuda-crash.html>).

<sup>145</sup> The families got roughly \$20,000 each from the airline.

<sup>146</sup> See Regulation (EC) No 787/2007 amending Commission Regulation (EC) No 474/2006 establishing the Community list of air carriers which are subject to an operating ban within the Community, 2007 O.J. (L 175) 10 at 21.

<sup>147</sup> *Convention for the Unification of Certain Rules Relating to International Carriage by Air*, Signed at Warsaw on 12 Oct. 1929, 137 LNTS 13.

<sup>148</sup> These include: *Protocol to Amend the Warsaw Convention on International Carriage by Air (1929)* (Hague Protocol) (478 UNTS 371); *[Guadalajara] Convention, Supplementary to the Warsaw Convention, for the Unification of Certain Rules Relating to International Carriage by Air Performed by a Person Other Than the Contracting Carrier* (1961) (500 UNTS 31); *Additional Protocol No. 1 to Amend Convention for the Unification of Certain Rules Relating to International Carriage By Air (1975)* 2097 UNTS 28; and *Additional Protocol No. 2 to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air (1975)* 2097 UNTS 69.

<sup>149</sup> *Convention for the Unification of Certain Rule for International Carriage by Air*, Signed at Montreal on May 28, 1999, TIAS 13038, 2242 UNTS 309, ICAO Doc. 9740.

<sup>150</sup> Thus on June 30, 2008, the law firm of Herrmann Scholbe filed a lawsuit in Los Angeles against TACA Airlines on behalf the victims of the May 30, 2008 air crash of TACA's flight TA 390 in Tegucigalpa, Honduras. See ([http://www.redorbit.com/news/business/1456145/herrmann\\_scholbe\\_files\\_lawsuit\\_on\\_behalf\\_of\\_air\\_crash\\_victims/index.html](http://www.redorbit.com/news/business/1456145/herrmann_scholbe_files_lawsuit_on_behalf_of_air_crash_victims/index.html)).

<sup>151</sup> This is very amply detailed in the invaluable looseleaf service most relied upon by practitioners of aviation litigation; P. Martin, J. D. McClean, et al. *Shawcross and Beaumont: air law*, (Butterworths 2007).

<sup>152</sup> In previous decades, Courts considered what factors constituted the "notice" of a carrier's limited liability. See *Chan v. Korean Airlines* 490 U.S. 122 (1989) and *Ludecke v. C.P.A.L.* 15 Avi 17,687 (S.C.C., 1979).

<sup>153</sup> See *Multimillion-Dollar Lawsuit Filed Against American Airlines In Crash Of Flight 587; Plaintiffs Allege Negligence and Pilot Error in the November Crash that Killed 260 People* (<http://www.colson.com/pr-030701.asp.htm>), and ()

<sup>154</sup> Most claims by passengers against airlines are settled and bound by a confidentiality clause; in rare and large cases, law firms will still find a way to get publicity. See (<http://www.wisner-law.com/experience.html>). A very small percentage of cases against airlines proceeds to trial.

In August 2005 during an attempted landing at Toronto Pearson Airport Air France 358 “overran the end of Runway 24L at about 80 knots and was destroyed by fire.”<sup>155</sup> A class action was quickly launched, claiming damages for negligence of the flight crew including “[f]ailing to maintain the Aircraft including its braking . . . systems . . . and [f]ailing to adequately train the Flight Crew on . . . the procedures for landing the Aircraft in the conditions present . . . at the time of the Crash and the braking distance required to safely stop the aircraft.”<sup>156</sup>

Air France paid \$10 million to settle the claims<sup>157</sup> but perhaps in an attempt to avoid full culpability for the crash, it sued the Greater Toronto Airports Authority for failing to maintain an “adequate margin of safety for aircraft in the event of an overrun event.”<sup>158</sup> In addition to the cost of settling the claims, Air France also suffered the loss of a very expensive six year old aircraft<sup>159</sup> and thus Air France undoubtedly learned a very costly lesson from this incident.

Each of the above cases has dealt with files related to international aviation, but very similar mechanism and approaches are available under domestic law. When Air Florida Flight 90 crashed into the 14<sup>th</sup> Street Bridge as a result of the flight crew’s “failure to use engine anti-ice during ground operation and takeoff”<sup>160</sup> the District of Columbia brought suit against the airline<sup>161</sup> after having spent “in excess of \$750,000 in rescuing the survivors, recovering the bodies of those killed in the crash, raising the airplane and its contents from the river, and performing other related emergency services.”<sup>162</sup> The damages to the bridge were later settled<sup>163</sup> but a Court dealt with passenger claims against the airline.<sup>164</sup>

Thus the legal process serves a vital role in disciplining air carriers that fail to meet expected standard of safety, and this enforcement is for the most part conducted without the participation of the regulator.

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<sup>155</sup> Transportation Safety Board of Canada. Aviation Investigation Report, Runway Overrun and Fire; Air France Airbus A340-313 F-GLZQ Toronto/Lester B. Pearson International Airport, Ontario, 02 August 2005, Report A05H0002, 12-DEC-2007, 115.

<sup>156</sup> *Abdulrahim v. Air France*, Court File No. 05-CV-294746 CP (June 1, 2006) Fresh as Amended Statement of Claim, p. 8.

<sup>157</sup> *Abdulrahim v. Air France*, 2010 ONSC 3736 (unreported).

<sup>158</sup> Bruce Campion Smith, “Air France sues over crash” *The Star*, (Toronto, June 4, 2008):NA. (<http://www.thestar.com/News/Canada/article/436518>).

<sup>159</sup> See Oakland Ross “When the only death is the plane” *The Star*, (Toronto, August 7, 2005):NA.

<sup>160</sup> See National Transportation Safety Board, *Aircraft Accident Report, Air Florida, Inc., Boeing 737-222, N62AF, Collision with 14th Street Bridge, Near Washington National Airport, Washington, D.C., January 13, 1982*, Report NTSB/AAR-82-8, August 10, 1982, 82,

<sup>161</sup> *District of Columbia v. Air Fla., Inc.*, 750 F.2d 1077 (D.C. Cir. 1984)

<sup>162</sup> David C. McIntyre, Tortfeasor Liability for Disaster Response Costs: Accounting for the True Cost of Accidents, 55 *Fordham L. Rev.* 1001 (1987). This article has a very good examination of the legal issues involved in trying to make this type of claim.

<sup>163</sup> *Id.* The settlement may have been influenced by the fact that the airline had entered Chapter 11; Air Florida sought protection from creditors on July 3<sup>rd</sup>, 1984. See Paul Stephen Dempsey and Laurence E. Gesell, *Airline Management Strategies for the 21<sup>st</sup> Century* (2006): 194.

<sup>164</sup> *In re Air Crash Disaster at Washington, D.C. on January 13, 1982*, 559 F.Supp. 333 (D.D.C.1983)

**8) Rethinking Aviation Safety Regulation**

In many cases, when an accident does occur, it is due in part to regulatory failure, typically a lack of proper oversight by the regulator.

For example Indonesia's State-owned Garuda airlines had a policy where "crews would receive a bonus based on a formula, which would consider the difference between planned fuel and actual fuel consumed"<sup>165</sup> and this policy was only reviewed<sup>166</sup> subsequent to a fatal accident, because accident investigators had noted the "pilot in command's attention became channelized and was fixated on landing the aircraft."<sup>167</sup>

However, even in Canada, where aviation safety is highly valued, the regulator only took a real interest in a small carrier, International Express Aircharter, after a fatal crash in January 2006.<sup>168</sup> In the aftermath of the crash, the regulator suspended the carrier's Air Operator Certificate<sup>169</sup> and upon discovering that the carrier had not performed required aircraft maintenance on schedule and that in one case "a maintenance inspection was overdue by more than 270 hours," ultimately cancelled the certificate.<sup>170</sup>

In both cases, the regulator acted *after* a fatal crash and this suggests fundamental weaknesses in enforcement. In such a case, it must be asked, would private sector enforcement of aviation safety be less efficient; in other words if the regulator did not exist, could market forces produce similar results?

Often overlooked by regulators is the simple reality that even where regulations fail to cover aviation safety issues; the market reacts. Safety is simply too important to commercial aviation to allow it to fall through the cracks of out-of-date regulation.

It is argued that the airline industry has four market force mechanisms that either separately or combined could produce similar results.

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<sup>165</sup> National Transportation Safety Committee, Boeing 737-497 PK-GZC Adi Sucipto Airport, Yogyakarta Indonesia 7 MARCH 2007 Aircraft Accident Investigation Report KNKT/07.06/07.02.35, p. 44.

<sup>166</sup> Ibid, 57.

<sup>167</sup> Ibid, 53.

<sup>168</sup> Transportation Safety Board of Canada Aviation Investigation Report, *Engine Power Loss Forced Landing Sonicblue Airways Cessna 208B (Caravan) C-GRXZ Port Alberni, British Columbia, 11 nm SS# 21 January 2006* Report A06P0010, 09 August 2007.

<sup>169</sup> See *Transport Canada Suspends International Express Aircharter Ltd.'s Air Operator Certificate*, Transport Canada Press Release P001/06, January 23, 2006.

<sup>170</sup> See *Transport Canada Fines International Express Aircharter Ltd. and Cancels Air Operator Certificate*, Transport Canada Press Release P003/06, March 22, 2006.

**a) Impact of Reputational Damage.**

It is a fact that “[n]o major airline can enjoy a competitive advantage by operating to airworthiness standards below the generally accepted level.”<sup>171</sup> Quite simply Passengers will not knowingly fly an airline that is not safe, no matter how low the fare.<sup>172</sup> Increasingly the public expects accident-free airlines and a group of 14 of the world’s largest commercial airlines<sup>173</sup> now can boast of an average of more than 25 years of flying without a single fatality.<sup>174</sup>

These airlines have collectively set a new standard and relative newcomer, Etihad Airways commits to making travel safe . . . by practicing the highest global standards.”<sup>175</sup> This is part of a “race to the top” where stellar, unblemished safety records will be the new norm. In this context, the current financial impact of a fatal accident on an airline cannot be underestimated. Indeed, so toxic is a fatal crash to the reputation of an airline that even a single accident can provoke commercial failure. It is thus very fortunate that the November 4, 2010 in-flight uncontained engine failure<sup>176</sup> aboard a Qantas Airbus A-380<sup>177</sup> did not result in a serious incident<sup>178</sup> that would have destroyed Qantas’ unbeatable record of 68 years of operation without a single passenger fatality.<sup>179</sup>

The 1996 crash of ValuJet flight 592 in the Florida Everglades<sup>180</sup> is perhaps the best example of the true impact of a major fatal accident on an airline. The crash resulted in the grounding of the

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<sup>171</sup> Doganis, R., *Flying off course: airline economics and marketing* (Routledge, 2010): 28

<sup>172</sup> Had Canadians known that Jetsgo had experienced 60 safety incidents in 4 years, they might have been less inclined to fly with the company. See “Safety issues dogged Jetsgo; One jet involved in eight ‘incidents’; In January, a plane veered off runway,” *Toronto Star*, 17 March 2005.

<sup>173</sup> These are Air Canada, Air India, Alitalia, All Nippon Airways, Avianca, British Airways, Continental, Emirates, Japan Airlines, KLM, Northwest, Qantas, South African Airways and Virgin Atlantic.

<sup>174</sup> The actual average is 28.5 years as of August 1, 2011. The figures do not include fatalities caused as a result of terrorist incidents.

<sup>175</sup> See Etihad Airways, “Our Vision” available at (<http://www.etihadairways.com/sites/etihad/ae/en/aboutetihad/etihadstory/pages/etihadvision.aspx>). Etihad, founded in 2003 has never experienced as much as a reported injury due to its operations.

<sup>176</sup> Australian Transport Safety Board, Transport Safety Report, In-flight uncontained engine failure overhead Batam Island, Indonesia 4 November 2010 VH-OQA Airbus A380-842, Aviation Occurrence Investigation – AO-2010-089 Preliminary, November 2010.

<sup>177</sup> Fortunately, that particular flight carried 5 pilots rather than the normal 3 see *Ibid*, 2.

<sup>178</sup> The incident was extremely complicated and in the hands of a less competent crew, could have become more serious. See (<http://www.news.com.au/travel/news/qantas-hero-pilot-retains-faith-in-a380/story-e6frfq80-1226005432827>) and (<http://media.aerosociety.com/aerospace-insight/2010/12/08/exclusive-qantas-qf32-flight-from-the-cockpit/3410/>) and (<http://sixtyminutes.ninemsn.com.au/article.aspx?id=8209663>).

<sup>179</sup> Qantas last passenger fatality occurred in 1943. See ([http://aviation-safety.net/database/dblist.php?sorter=datekey\\_desc&kind=%&cat=%&page=1&field=Operatorkey&var=4842](http://aviation-safety.net/database/dblist.php?sorter=datekey_desc&kind=%&cat=%&page=1&field=Operatorkey&var=4842)).

<sup>180</sup> National Transportation Safety Board, Aircraft Accident Report, In-flight Fire and Impact with Terrain ValuJet Airlines Flight 592 Dc-9-32, N904VJ Everglades, Near Miami Florida May 11, 1996, Report NTSB/AAR-97/06, August 19, 1997.



airline by the FAA,<sup>181</sup> criminal prosecution of its maintenance contractor,<sup>182</sup> over 50 wrongful death actions,<sup>183</sup> the destruction of its reputation<sup>184</sup> and the filing of a lawsuit against the airline by its investors.<sup>185</sup> In fact, so badly damaged was ValuJet's reputation that the carrier, after having spent \$8 million on a media campaign to salvage its image, bought a smaller carrier, Air Tran, and adopted the latter's name and spent another \$40 million repainting its planes in Air Tran colours.<sup>186</sup>

Generally the impact of a crash on a major airline's brand in terms of costs and potential downturn in customer can be "quite devastating"<sup>187</sup> and even large carriers can be affected;<sup>188</sup> Pan Am 103<sup>189</sup> and TWA 800<sup>190</sup> had massive negative impacts on the commercial fortunes of the airlines involved, and the first event helped put Pam Am out of business.<sup>191</sup> In practical terms, the only way that an airline can escape unscathed from a serious fatal accident is to be able to squarely place the blame elsewhere.

For example, United Airlines has had, over the past 21 years, five incidents where at least one person has perished; but in each case, someone else could be held responsible. In three of the accidents, Flight 232 in Sioux City in 1989,<sup>192</sup> Flight 585 outside Colorado Springs in 1991<sup>193</sup>

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<sup>181</sup> This was seen by many as unfair. See E. Ben-Yôsēf, *The evolution of the US airline industry: theory, strategy and policy* (Springer, 2005), 185.

<sup>182</sup> S. Michaelides-Mateou & A. Mateou, *Flying in the Face of Criminalization: The Safety Implications of Prosecuting Aviation Professionals for Accidents* (Ashgate USA, 2010), 61.

<sup>183</sup> Don Plummer Cox News Service "With millions at stake, crash suits reopen wounds," *The Journal Record*, Oklahoma City, May 19, 1997

<sup>184</sup> For a detailed look at the politics involved see, R.W. Cobb & D.M. Primo, *The plane truth: airline crashes, the media, and transportation policy* (Brookings Institution Press, 2003), 80-102.

<sup>185</sup> The investors believed the allegations against the carrier's reputation. See *In re ValueJet, Inc., Securities Litigation*, United States District Court, Northern District of Georgia, Atlanta Division, Civil Action No. 1-96-CV-1355-JTC.

<sup>186</sup> This happened within a year of the accident. See *Id.*, 98-99.

<sup>187</sup> See Transcript of Minutes, Standing Committee on Transport, 39<sup>th</sup> Parl, 1<sup>st</sup> session Hansard Tran 10 (June 15, 2006) See Statement of Mr. Marc Grégoire (Assistant Deputy Minister, Safety and Security Group, Department of Transport). 11:20.

<sup>188</sup> See generally, Jean-Claude Bosch, E. Woodrow Eckard and Vijay Singal, "The Competitive Impact of Air Crashes: Stock Market Evidence" 41 *J.L. & Econ.* 503 (1998).

<sup>189</sup> Air Accident Investigation Branch, Aircraft Accident Report 2/90, Report on the accident to Boeing 747-121m N739PA at Lockerbie, Dumfriesshire, Scotland on 21 December 1988, August 6, 1990. Even though the crash of Pan Am 103 was the result of a terrorist bombing, families of the victims recovered from Pan Am for having allowed the bomb on board. See *In re Air Disaster*, 37 F.3d 804 (2d Cir. 1994).

<sup>190</sup> See National Transportation Safety Board, Aircraft Accident Report, In-flight Breakup Over the Atlantic Ocean Trans World Airlines Flight 800 Boeing 747-131, N93118 Near East Moriches, New York July 17, 1996, Report NTSB/AAR-00/03, August 23, 2000. The investigation took over 4 years to complete.

<sup>191</sup> See John Greenwald and Thomas McCarroll "Terror on Flight 800: More Trouble for Resurgent TWA" *Time* (July 29, 1996): NA

<sup>192</sup> National Transportation Safety Board, Aircraft Accident Report, United Airlines Flight 232, McDonnell Douglas DC-10-10, Sioux Gateway Airport, Sioux City, Iowa, July 10, 1989, Report NTSB/AAR-90-06, November 1, 1990, 73. There was a catastrophic failure of the No. 2 tail-mounted engine during cruise flight.

and Flight 26 at Tokyo in 1997<sup>194</sup> the blame could be apportioned respectively to the engine maker, the rudder maker and turbulence. The other two flights, 175 and 93 were lost due to terrorist actions on September 11, 2001. Thus, United can justly claim a stellar safety record.<sup>195</sup>

However airlines that cannot easily exculpate themselves from blame go to extraordinary means to avoid negative publicity; immediately after the Air Florida Flight 90 crash on January 13<sup>th</sup> 1982 black paint was hurriedly applied to the tail fin in an attempt to conceal the identity of the airline.<sup>196</sup>

A more curious situation arose in 2009 when a Bombardier DHC-8-400, belonging to previously accident free Colgan Air,<sup>197</sup> crashed on approach to Buffalo killing all aboard and the NTSB blamed the crash on pilot error and poor training.<sup>198</sup> The PBS network's show *Frontline* featured the crash in an investigative report called "Flying Cheap"<sup>199</sup> and Colgan Air was called to appear before Congress<sup>200</sup> but the airline's parent only reported "a charge of \$0.6 million associated with the loss of a Q400 aircraft."<sup>201</sup> In this case the financial impact on the carrier was dramatically reduced by the fact that it does virtually all of its flying on behalf of other carriers and its aircraft usually wear the livery of those carriers.<sup>202</sup>

In other cases, reputational damage may be limited by the initial value of the reputation and also by the existence of consumer alternative(s). For example where a state-owned carrier dominates

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<sup>193</sup> National Transportation Safety Board, Aircraft Accident Report, Uncontrolled Descent and Collision With Terrain United Airlines Flight 585 Boeing 737-200, N999UA 4 Miles South of Colorado Springs Municipal Airport Colorado Springs, Colorado March 3, 1991, Report NTSB/AAR-01/01, March 27, 2001, 139. "The rudder surface most likely deflected in a direction opposite to that commanded by the pilots."

<sup>194</sup> This was a 747 flight from Tokyo to Honolulu, one person died after extreme turbulence. The crew was only partly to blame as it was difficult to obtain adequate weather forecasts of over-ocean turbulence and clear air turbulence had been present. See ([http://www.nts.gov/aviationquery/brief2.aspx?ev\\_id=20001208X09291&ntsbn=DCA98MA015&akey=1](http://www.nts.gov/aviationquery/brief2.aspx?ev_id=20001208X09291&ntsbn=DCA98MA015&akey=1)).

<sup>195</sup> United has had no fatal accidents in the past 5 years. See ([http://www.airline-safety-records.com/airline\\_safety\\_five\\_year\\_table.htm](http://www.airline-safety-records.com/airline_safety_five_year_table.htm)).

<sup>196</sup> This common post-accident practice is driven by marketing concerns; the Flight 90 crash was estimated to have cost Air Florida around 100,000 reservations. See Macarthur Job, *Air disaster*, Volume 2, (Aerospace Publications, 1998); 91

<sup>197</sup> Mark Babinech and Bill Hensel Jr. "Records show Colgan flights had been fatality free" *Houston Chronicle*, Feb 13, 2009 available at (<http://www.chron.com/news/article/Records-show-Colgan-flights-had-been-fatality-free-1737290.php>).

<sup>198</sup> See National Transportation Safety Board, Aircraft Accident Report, Loss of Control on Approach Colgan Air, Inc. Operating as Continental Connection Flight 3407 Bombardier DHC-8-400, N200WQ Clarence Center, New York February 12, 2009, Report NTSB/AAR-10/01, February 2, 2010, 155.

<sup>199</sup> See (<http://www.pbs.org/wgbh/pages/frontline/flyingcheap/>).

<sup>200</sup> See Statement of Dan Morgan Vice President, Safety & Regulatory Compliance Colgan Air, Inc. before the Subcommittee on Aviation Committee on Transportation and Infrastructure United States House of Representatives June 11, 2009 available at ([www.colganair.com/flight\\_3407\\_releases/daniel\\_morgan\\_testimony.pdf](http://www.colganair.com/flight_3407_releases/daniel_morgan_testimony.pdf))

<sup>201</sup> See "Pinnacle Airlines Corp. Reports 2009 First Quarter Financial Results" (May 7, 2009) available at (<http://phx.corporate-ir.net/phoenix.zhtml?c=131072&p=irol-newsArticle&ID=1285721&highlight=>).

<sup>202</sup> See (<http://www.colganair.com/index.php>)

a domestic market, or where a small airline is unknown to consumers, the pre-occupation with aviation safety, will not be as strong as it would be with a large commercial airline operating in a competitive market.

Thus for small regional airlines without a high public profile or degree of sophistication, the traditional regulatory practices used in the 1980s in most of the global north are appropriate.

However for market-driven, major airlines dealing directly with the public the value of a stellar safety record is underscored by the reaction of Singapore Airlines, which had never experience a passenger fatality due to its operations,<sup>203</sup> when one of its 747s crash on take-off from Taiwan in October 2000. During the investigation, on the airline's urging, Singaporean authorities disputed Taiwanese findings that the aircraft's crew had lacked "situational awareness."<sup>204</sup>

Thus, the importance of safety to the airline industry cannot be overstated and it is much too important to leave to regulators alone. It is therefore not remarkable, that in 1997, when Cathay Pacific and its subsidiary Dragonair had in-flight shut-down problems with their A-330s, the airlines grounded their entire fleet for two weeks for modifications<sup>205</sup> before the regulator had required such action. Similarly, when Southwest Airlines, which has never experienced a passenger fatality due to its operations<sup>206</sup> saw a flight forced to land due to a hole in the fuselage, the airline grounded that fleet the next day and began inspecting each aircraft in cooperation with the manufacturer.<sup>207</sup>

### **b) Airline Alliances**

Airline alliances are based on common standards and this includes aviation safety. So it is not surprising that prospective Star Alliance member Air India was subjected to a safety review by other alliance members.<sup>208</sup>

Over 40 years ago, code-sharing and blocked-space arrangements<sup>209</sup> facilitated commercial cooperation between airlines.<sup>210</sup> However, when Pan Am was forced to cooperate with Aeroflot

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<sup>203</sup> See (<http://aviation-safety.net/database/operator/airline.php?var=5344>). The deaths of 4 hijackers in 1991 and of 2 crew killed on a training flight in 1997 are not included in the passenger numbers.

<sup>204</sup> The crash killed 83 people and was the result of the Singapore Airlines aircraft taking off from a closed runway in dark, rainy conditions. See the debate between Singaporean and Taiwanese officials, Aviation Safety Council, *Crashed on partially closed runway during takeoff Singapore Airlines flight 006 Boeing 747-400, 9V-SPK CKS airport, Taoyuan, Taiwan October 31, 2000*, Report ASC-AAR-02-04-001, October 1, 2000, 7-40 to 7-59.

<sup>205</sup> See (<http://www.theaustralian.com.au/business/aviation/cathay-pacific-pilots-hailed-as-heroes/story-e6frg95x-1225854262928>).

<sup>206</sup> See (<http://aviation-safety.net/database/operator/airline.php?var=5276>)

<sup>207</sup> See (<http://aviation-safety.net/database/record.php?id=20110401-0>)

<sup>208</sup> See Heather Timmons, "Star Alliance Puts Air India on an Indefinite Standby" *New York Times*, August 1, 2011

<sup>209</sup> This can be expressed as "Two planes flying wing to wing"; John McCaffrey, then of Pan Am, in conversation with the author, September, 1990.

on the Moscow-New York route in 1990, Pan Am aircraft were used<sup>211</sup> in part because airlines do not want to harm their reputation by putting passengers on board a less-reliable airline. Thus, the NTSB held a symposium in October 2010 to examine the code-share practices of U.S. carriers with small feeder airlines:

“We have investigated many accidents in which passengers bought tickets on a major carrier and flew all or part of their trip on a different carrier - one that may have been operating to different safety standards than the carrier that issued the ticket. While all carriers are required to meet minimum standards, a clearer picture and deeper understanding of the best safety practices for code-sharing arrangements are the goals of this symposium.”<sup>212</sup>

However, in her concluding remarks at the symposium NTSB Chair Deborah A.P. Hersman stated:

“Perhaps the phrase “code-sharing” is itself a bit misleading – after all, only members of the industry ever use airline codes. The travelling public might better understand the practice if it was dubbed name-sharing, because it’s really the airline’s name and their reputation that is being shared.”<sup>213</sup>

The notion that one airline’s reputation is engaged through the commercial activities of another, results in the very careful selection of partners with similar values. Emerging new developments are making partner selection criteria even more important.

In recent years, a new concept, “metal neutrality” has emerged:

“Metal neutrality, is an industry term meaning that the partners to an alliance agreement are indifferent as to which of them operates the aircraft when they jointly market services. Without a “metal-neutral” sales environment, the partners have a strong economic incentive to book passengers on their own aircraft and retain a larger share of the revenue for themselves, which may not be in the best interest of the consumer or the alliance as a whole.”<sup>214</sup>

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<sup>210</sup> See generally, Landy, Burton A., "Cooperative Agreements Involving Foreign Airlines: A Review of the Policy of the United States Civil Aeronautics Board", 35 *Journal of Air Law & Commerce*, Southern Methodist University, Dallas, 1969.

<sup>211</sup> John McCaffrey, then of Pan Am, in conversation with the author, September, 1990.





<sup>212</sup> Office of Public Affairs, “NTSB to hold Symposium on airline code-sharing arrangements their role in Aviation Safety” NTSB August 16, 2010.

<sup>213</sup> Closing Statement Chairman Deborah A.P. Hersman National Transportation Safety Board Code-Sharing Symposium October 26-27, 2010, available at (<http://www.nts.gov/news/speeches/hersman/daph101027.html>)

<sup>214</sup> DOT Order: 2009-7-10 (July 10, 2009): 15

Thus, in practical terms, it no longer matters whether a passenger flies with airline “A” or airline “B” as long as both are in a metal neutral arrangement. The U.S. DOT has granted “approval of an integrated joint venture agreement called Atlantic Plus-Plus (“A++”) involving Air Canada, Continental, Lufthansa, and United”<sup>215</sup> and allowed the creation of metal neutrality between them.<sup>216</sup>

Thus, the 19:25 daily flight from Toronto to Paris lists the codes of each of the four carriers as shown in the example below, and under a metal neutral regime, they will be indifferent as to which of them actually operate the flight.<sup>217</sup>

	Flight	Dep	Arrive	D: ORD	A: CDG
 Air Canada	880	Toronto	Paris	19:25	8:30
 Continental Airlines	8252	Toronto	Paris	19:25	8:30
 Lufthansa	5511	Toronto	Paris	19:25	8:30
 United Airlines	8252	Toronto	Paris	19:25	8:30

One of the other results of metal neutrality is that a customer buying an inter-continental ticket with one of the four associated airlines, might be given boarding passes on a flight or combination of flights offered by one or more of the other members.<sup>218</sup>

Here in each case the reputation of the contracting airline assures passengers that the partner airlines meet that standard. If the standards of the partner carrier are lower, the reputation of the contracting airline suffers.

Clearly such an arrangement is dependent on common standards and these include safety.<sup>219</sup> Each of the carriers must be confident that a passenger travelling on a jet operated by one of the associated carriers will enjoy the same benefits as if the passenger had flown with that carrier. For this reason, none of the alliances includes carriers from States who appear on the U.S. or EU banned airline lists.

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<sup>215</sup> Ibid, 1.

<sup>216</sup> Ibid, 15.

<sup>217</sup> The Toronto-Paris route was chosen because any of the four carriers could exercise full traffic rights over the route. Air Canada and Lufthansa have rights pursuant to the Canada-EU Open Skies agreement. See Canada Concludes Historic Air Transport Negotiations with European Union, Transport Canada Press Release H237/08, December 9, 2008. Similarly Continental and United can operate Toronto-Paris services as under 5<sup>th</sup> freedom provision of the U.S.-Canada and U.S.-EU open sky agreements. See Air Transport Agreement Between the Government of the United States of America and the Government of Canada, Mar. 12, 2007, CTS 2007/2. See also *Air Transport Agreement between the United States of America and the European Union*, April 30, 2007. (<http://www.state.gov/e/eeb/rls/othr/ata/e/eu/114768.htm>).

<sup>218</sup> For example a passenger who books a ticket on Lufthansa from Paris to Austin Texas, may fly with one or more of Lufthansa, Air Canada, Continental or United, and change aircraft in one or more of Chicago, Houston, Newark or Toronto.

<sup>219</sup> Each of the carriers has operated without an operationally-caused passenger fatality for at least 14 years.

In this way, the market isolates and marginalizes carriers that do not have an acceptable safety record.

**c) Insurance Companies**

The insurance industry is completely neutral and offers coverage based on assessed risk.

“Accidents . . . can have an impact on insurance. If [an airline] has one or more accidents, normally their insurance, like your car insurance, will go up. If a company has a number of accidents, the insurance may drive the company out of business faster than we could, [even] if that company has followed the rules.”<sup>220</sup>

Thus liability insurance premiums would be lower for Qantas than for Hewa Bora Airways<sup>221</sup> but at a certain point a situation could be reached where most insurance companies would deny coverage, or perhaps insist on amended practices. Thus the Insurance industry is seen as having the ability to resolve some particular safety regulation problems.<sup>222</sup>

One of the less well-known forms of insurance that is currently available is Scheduled Airline Failure Insurance (SAFI), which offers indemnity to travellers stranded by an airline bankruptcy, and U.K.-based International Passenger Protection (IPP) is a leading underwriter of such policies.<sup>223</sup> The company will not provide coverage with respect to an “airline where there is a threat of, or has filed or applied for any form of insolvency or insolvency protection at the time of effecting cover or issuance of the air ticket.”<sup>224</sup>

However, the firm also provides a very useful service; it lists the names of the airlines with respect to whom it will not provide coverage<sup>225</sup> and thus consumers have valuable market information allowing them to avoid certain carriers as airlines often appear on this list weeks or months before their financial troubles make newspaper headlines.

If the firms that provide airline liability insurance with respect to aviation accidents were to publish a safety rating comparable to the credit rating published by Moody’s and Standard &

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<sup>220</sup> See Transcript of Minutes, Standing Committee on Transport, 39<sup>th</sup> Parl, 1<sup>st</sup> session Hansard Tran 10 (June 15, 2006) See Statement of Mr. Marc Grégoire (Assistant Deputy Minister, Safety and Security Group, Department of Transport). 11:20

<sup>221</sup> Hewa Bora Airways is on the EU list of Banned airlines; the carrier has had 2 fatal accidents since 2008. See (<http://aviation-safety.net/database/operator/airline.php?var=6049>).

<sup>222</sup> See *generally*, Transport, Australia. Bureau of & Communications Economics, Insurance and aviation safety (Bureau of Transport and Communications Economics, 1997).

<sup>223</sup> See (<http://www.protectmyholiday.com/about-us.aspx>).

<sup>224</sup> See (<http://www.ipplondon.co.uk/airline-news.asp>).

<sup>225</sup> *Id.*

Poor's,<sup>226</sup> market pressures (in addition to higher than average insurance rates) would force airlines to meet higher safety standards.

Thus the Insurance Industry has the potential to provide very strong market-driven incentives for airline to maintain high safety standards.

#### ***d) Regulation Through Information***

Requirements that the private sector provide certain information to the public give the public the ability to influence corporate behaviour. America's *Emergency Planning and Community Right-to-Know Act of 1986*,<sup>227</sup> gives the public the unprecedented power to raise standards:

"Companies that report their normal and lawful release of chemicals have suffered adverse public relations."<sup>228</sup> At the same time, it is argued that unless the information is placed in the proper context, it could be misused and produce counter-productive results. To be meaningful, information released to the public should be placed in perspective by supplying the public with an assessment of the real concerns or issues raised.

"Information regulation may be defined as the disclosure of a polluter's environmental performance to the general public . . . Such disclosure can act as a sanction, especially when it empowers third parties to take action against the polluter. . . . The disclosure of environmental performance data functions by harnessing social and market forces to pressure polluter to change their behaviour."<sup>229</sup>

These market-driven incentives have been seen as effective with respect to the control of pollution by industry.<sup>230</sup> It is possible that Global North initiatives requiring labels on processed foodstuffs<sup>231</sup> apparently encouraging consumers to avoid products that are high in fat, or salt or cholesterol may be an attempt to change the product offering of food producers.

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<sup>226</sup> Standard and Poor's publishes their credit rates for Sovereign States and this influences those State's borrowing capacity and the interest rates the States pay on debt. See (<http://www.standardandpoors.com/ratings/sovereigns/ratings-list/en/us/?subSectorCode=39&sectorId=1221186707758&subSectorId=1221187348494>).

<sup>227</sup> Codified at 42 U.S.C. 11001. See also 40 CFR PART 372 — Toxic Chemical Release Reporting: Community Right-to-know.

<sup>228</sup> Finto, Kevin J. "Regulation by Information through EPCRA" 4 Nat. Resources & Env't. 13 (1989-1990): 48.

<sup>229</sup> Zaelke, D., D. Kaniaru, E. Kružíková, International Network for Environmental Compliance, Enforcement, Institute for Governance & Sustainable Development, *Making law work: environmental compliance & sustainable development* (Cameron May, 2005): 14.

<sup>230</sup> See Jérôme Foulon, Paul Lanoie, Benoît Laplant, "Incentives for Pollution Control: Regulation or Information?" 44 J. Env'tl Econ. & Mgmt, 169-187

<sup>231</sup> See 21 CFR 101.9 *Nutrition labeling of food* and *Commission Directive 2008/100/EC of 28 October 2008 amending Council Directive 90/496/EEC on nutrition labelling for foodstuffs as regards recommended daily allowances, energy conversion factors and definitions*, 2008 O.J. (L 285) 9.

In the airline industry the U.S. Bureau of Airline Statistics<sup>232</sup> publishes information that allows users to compare airlines by punctuality, number of tarmac delays, number of chronically delayed flights, financial health, and efficiency of hub airports.<sup>233</sup> This agency could presumably also publish airline safety information, but it has not yet done so.

There are, however two private sector organizations that are currently monitoring global airline safety:

The International Air Transport Association (IATA) is the industry association of international airlines and claims that its Operational Safety Audit (IOSA) “is the benchmark for global safety management in airlines.”<sup>234</sup> However even though passing such an audit is a condition of IATA membership, the details of a specific audit must be requested from IATA, and IATA does not publish any data that would facilitate a direct comparison between carriers with respect to their safety records.<sup>235</sup>

Another organization, the Flight Safety Foundation is an independent, impartial and non-profit international membership organization focusing on global aviation safety<sup>236</sup> and publishes the Aviation Safety Network database, which includes every accident experienced by a commercial carrier since 1943.<sup>237</sup> It allows an easy determination of the number of persons killed during the commercial operations of a carrier during a given interval and thus based on this, a table such as Appendix II *infra* can be created. It contains raw, unprocessed data, but it gives an idea how such information could influence travel purchase decisions; and more importantly, it would give carriers even stronger incentives to strive for accident free years.

Thus absent the regulator, there exist market drive or market dependent mechanisms that are capable of ensuring suitably high standards of aviation safety and in certain countries these mechanisms are already performing these functions.

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<sup>232</sup> See *Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991* Pub. L. 102-240, 105 Stat. 1914 (1991). Section 6006 - Bureau of Transportation Statistics.

<sup>233</sup> In some cases users have do their own comparisons, but the data is very comprehensive. See ([http://www.bts.gov/programs/airline\\_information/](http://www.bts.gov/programs/airline_information/)).

<sup>234</sup> See (<http://www.iata.org/ps/certification/iosa/Pages/registry.aspx>).

<sup>235</sup> Indeed, the value of the Audit is uncertain, one of the airlines that has passed the audit, Philippine Airlines, is currently on the EU list of banned airlines. See (<http://aviation-safety.net/database/operator/airline.php?var=4878>).

<sup>236</sup> See (<http://flightsafety.org/about-the-foundation>).

<sup>237</sup> The Aviation Safety Network database (<http://aviation-safety.net/database/>), lists all carriers and all accidents but a direct comparison between airlines is not easy.



### C) Conclusion

That many of the world's major airlines have been operating for nearly two decades without a single passenger fatality<sup>238</sup> confirms the new norm; commercial airline flights must be accident free. This justifies the increasingly exhaustive investigations into the root causes of airline accidents; TWA 800 and Air France 447 needed to be explained so that travellers could be assured once again that flying is indeed safer than driving.

In cases such as these, regulations inevitably follow, but if they do not, the world's major airlines are always quick to embrace the findings and recommendations.

Quite simply in a world where insurance companies are offering free miles to Qantas frequent flyers,<sup>239</sup> safe flying is now the passenger's expectation, just as it is assumed that tap water is safe to drink, that phone service is working and that the local grocer's shelves are stocked.

Thus it is not surprising that the commercial consequences, from reputational damage to legal liability, of a fatal airline crash are potentially ruinous for an airline. An airline that informs the public that it was "following the rules" is guilty; crashes must be avoided at all costs. Such a reality demands that the carrier's safety standards eclipse those of the regulator, and as the distance between the regulator's standard and that of the airline increases, the regulations become less relevant.

The commercial aviation industry has arrived at a point where the market no longer cares what the regulator does; the market simply demands safe flights.

The investigation of major airline accidents are both exhaustive and transparent, allowing all interested parties to learn both the cause and those measures that would avoid future occurrences. Airlines that regulator shop, and the banning of airlines registered in various States confirm that the presence of a domestic regulator is no longer sufficient or necessary to assure safe flight, especially when both aircraft manufacturer and airlines are eagerly applying the lessons from past accidents and constantly improving best practices.

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<sup>238</sup> See *infra* Appendix II: International Aviation Safety 1986-2011.

<sup>239</sup> See (<http://www.onepath.com.au/personal/insurance/qantas-frequent-flyer.aspx?TCID=QFF-001>)

In this context, it is time to question, whether current safety regulation in many States plays a significant role in advancing the safety of commercial aviation in that State, and whether there are not, either domestically or internationally, other mechanisms either regulatory or market-driven that would achieve the same result at less cost.

### Appendix 1: Countries whose Airlines are Banned from EU Skies.

	2006			2007			2008			2009			2010			2011
	MR	JY	OC	MR	JY	OC	AP	JY	NO	AP	JY	NO	MR	JY	NO	AP
Afghanistan																
Angola																
Benin																
Congo																
Dem Rep Congo*																
Djibouti																
Equatorial Guinea																
Gabon																
Indonesia																
Kazakhstan																
Kyrgyz Republic																
Liberia																
Mauritania																
Mozambique																
Philippines																
Sierra Leone																
Sudan																
Swaziland*																
Zambia																

NOTE: the grey sections show the period during which the indicated State's carriers have been banned from European skies.<sup>240</sup> States whose carriers have also been banned by the FAA's (IASA) Program<sup>241</sup> are marked with an asterisk, but the Table does not list nine States that only appear on the FAA IASA list.<sup>242</sup> There are presently over 25 States whose carriers are banned by one or both of the EU or the U.S.

<sup>240</sup> Information taken from Commission Regulation (EC) No 474/2006 establishing the Community list of air carriers which are subject to an operating ban within the Community 2006 O.J. (L 84) 14 and the following regulations which amended it: Regulation (EC) No 910/2006, 2006 O.J. (L 186) 16; Regulation (EC) No 1534/2006; 2006 O.J. (L 283) 27; Regulation (EC) No 235/2007, 2007 O.J. (L 66) 3; Regulation (EC) No 787/2007, 2007 O.J. (L 175) 10; Regulation (EC) No 1400/2007, 2007 O.J. (L 311) 12; Regulation (EC) No 331/2008, 2008 O.J. (L 102) 3; Regulation (EC) No 715/2008, 2008 O.J. (L 197) 36; Regulation (EC) No 1131/2008, 2008 O.J. (L 306) 57; Regulation (EC) No 289/2009, 2009 O.J. (L 95) 16; Regulation (EC) No 619/2009, 2009 O.J. (L 182) 4; Regulation (EC) No 1144/2009, 2009 O.J. (L 312) 16; Regulation (EC) No 237/2010, 2010 O.J. (L 84) 25; Regulation (EC) No 590/2010, 2010 O.J. (L 170) 9; Regulation (EC) No 1071/2010, 2010 O.J. (L 306) 44; and Regulation (EC) No 390/2011, 2011 O.J. (L 104) 10.

<sup>241</sup> International Aviation Safety Assessments.

<sup>242</sup> These States are Belize, Gambia, Haiti, Honduras, Kiribati, Nicaragua, Paraguay, Uruguay and Zimbabwe. See (<http://www.faa.gov/about/initiatives/iasa/media/iasaws.xls>).

## Appendix II: International Aviation Safety 1986-2011

	Fatalities	Accidents <sup>243</sup>	Fatal Accidents	Years w/o Fatality <sup>244</sup>
Aeroflot	75	7	1	17
Air Canada	0	3	0	28
Air France	340	9	3	2
Air India	0	1	0	29
Air New Zealand	0	2	0	32
Alitalia	46	6	1	21
All Nippon Airways	0	1	0	40
American Airlines	431	13	3	10
Avianca	216	2	2	21
British Airways	0	4	0	35
Continental	28	7	1	24
Delta	14	6	2	15
Emirates	0	3	0	26
Ethiopian Airlines	130	8	4	1
Garuda Indonesia	282	5	7	4
Japan Airlines	0	2	0	26
Kenya Airways	283	4	4	4
KLM	0	3	0	34
Korean Air	310	10	4	12
Lan Chile	21	2	2	20
Lufthansa	2	1	0	18
Northwest	154	12	1	24
Qantas	0	5	0	68
Ryanair	0	2	0	26
Singapore Airlines	83	2	1	11
South African Airways	159	1	1	24
Southwest	0	6	0	44
United	137	4	3	14
US Airways	220	10	5	17
Virgin Atlantic	0	1	0	27
<b>Average<sup>245</sup></b>	<b>97.70</b>	<b>4.79</b>	<b>1.43</b>	<b>20.90</b>

<sup>243</sup> Accidents do not include any terrorist-related incidents, or any incidents occurring on services flown by code-share independent carriers operating flights on behalf of a larger carrier.

<sup>244</sup> This indicates the shorter of the years to the most recent fatal accident or the date of the airline's foundation. All of the airlines chosen were founded prior to 1986.

<sup>245</sup> The average number of accident-free years does not include Qantas.