International Aviation Safety Association

From the Ashes of Horror

SEVEN YEARS LATER

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Foreword

Raymond M Romano, born July 14th 1954, was a certified public accountant and partner with the international accounting firm KPMG Peat Marwick. He graduated from Valhalla High School in 1972 and received a Bachelor of Science degree from Mercy College and Master of Business Administration degree from Pace University. In October 1981, he married Lyn Towndrow and was the proud father of three children, Raymond, Randy and Kathy.

Seven years ago today on September 2nd 1998, Raymond M Romano boarded Swissair Flight 111 at JFK Airport, New York on a scheduled flight to Geneva, Switzerland, with 214 passengers and 14 crewmembers. About 53 minutes after departure, while cruising at flight level 330, the flight crew smelled an abnormal odour in the cockpit. 13 minutes later the aircraft's flight data recorder began to record a rapid succession of aircraft systems-related failures. The flight crew declared an emergency. One minute later, radio communications and secondary radar contact with the aircraft were lost, and the flight recorders stopped functioning. Five and a half minutes later, the aircraft crashed into the ocean about five nautical miles southwest of Peggy's Cove, Nova Scotia, Canada. Raymond, together with the other two hundred and twenty eight people, was dead.

It was against this tragic, horrific, background that Raymond's wife, Lyn S Romano, formed the International Aviation Safety Association (IASA). IASA, a non-profit organization, was *officially* formed on March 4th 1999, albeit the idea was conceived within weeks of *the* crash. *A* crash that in addition to the lives it abruptly and *needlessly* ended, has directly affected hundreds if not *thousands* of people. In Raymond's case, the crash robbed Lyn of a husband, three children of their father, a mother of her son, a sister of her brother, a mother-in-law of her son-in-law, a sister-in-law of her brother-in-law and so on. Then there were his friends, work colleagues and professional associates. The point is, aviation safety should never be considered in a vacuum; passengers are not the same as 'seat numbers' and when regulatory agencies speak in terms of 'perceived benefit' they should take stock of not only the lives lost in this and other tragedies but those left behind whose nights are plagued with nightmares and whose days are an ongoing battle to try to make some sort of sense of the loss they have suffered.

This is why IASA was formed. In an arena dominated by regulatory and commercial interests, a force was needed that could work through the myriad of technical data and make a meaningful contribution to that debate whilst tending to the human issues that aviation safety encompasses. IASA was also unique in that Lyn Romano would fund it and would not accept donations. In a February 23rd 1999 interview with the Canadian Press Lyn stated:

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> "They're going to try to pay me off for my husband's life… It's blood money; I can't touch it. The beauty is that with what they give me I get to go after them and everybody else to do what they should have done in the first place."

With the 'blood money' IASA established principal offices in New York, the United Kingdom and Australia in addition to temporary offices in Holland and Canada. By virtue of our financial independence, IASA has become an often candid and refreshingly unbiased voice; a voice that has penetrated the Executive Office of the President of the United States of America, the National Aeronautics and Space Administration (NASA), the General Accounting Office (GAO), the National Transportation Safety Board (NTSB), the FAA, the Transportation Safety Board of Canada (TSB), the United Kingdom House of Commons Transportation Select Committee and the European Joint Aviation Authorities (JAA).

In the seven years since the crash of Swissair 111, IASA has not only tackled issues specific to Swissair. The September 11th 2001 terrorist atrocities, shifted attention to security issues and to an extent halted progress in relation to other, non-security related, issues. In spite of this, we have been unrelenting in our quest to make flying as safe a form of transport as is humanly possible. Through our website, www.iasa-intl.com, IASA offers both the flying public and those engaged in the aviation and related industries, a comprehensive resource of data and the opportunity to contact us in the strictest of confidence. Some have contacted us to express their thanks for the work we do whilst others have a question or a concern that warrants our attention. Regardless of the source of the communication we are always willing to lend whatever assistance we can. It is as important to us to answer a legitimate enquiry from a worried passenger as it is to address our concerns to a government agency. Both sides of the spectrum are essential in progressing issues that, if left unchecked, result in the loss of innocent lives.

It is our sincere hope that through this report we can highlight our primary activities in the field of aviation safety since our formation and offer you an insight into the brutal realities of a commercial airline disaster.

We dedicate this retrospective to the two hundred and twenty nine people that were killed in the September 2nd 1998 crash of Swissair 111 and the many others that have lost their lives in other aviation disasters both before and *since*.

May they rest in peace.

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Introduction
The Many Faces of Aviation

Swissair Flight 111 departed JFK Airport, New York, USA, at 2018 eastern daylight savings time on a scheduled flight to Geneva, Switzerland and approximately 73 minutes later crashed into the sea off the coast of Nova Scotia, Canada. Within hours, there was growing speculation that a catastrophic electric failure aboard the seven-year old MD-11 was a likely culprit considering the pilot had reported an abnormal odour in the cockpit nineteen minutes before impact. It was also the case that the plane's flight recorder had not recorded the final six minutes of the flight, suggesting that the plane had lost all electrical power prior to impact.

If only it was *that* simple.

The official investigation into the crash, carried out by the Transportation Safety Board of Canada (TSB), took four and a half years and cost in *excess* of $40m. When the TSB released their final report on March 27th 2003 they cited the investigation as '…the largest, most complex aviation safety investigation the TSB has ever undertaken'.

What the crash of Swissair Flight 111 has demonstrated is that when considering the circumstances in which an aircraft crashes one has to look not only at the conduct of the airline and the crew concerned but also the conduct of the aircraft manufacturer, the third parties who carry out modifications to aircraft and most importantly in this case the regulator; the US Federal Aviation Administration (FAA).

As an industry, aviation is *elitist*. It is an industry made up of a number of clubs. There are clubs made up of airlines, manufacturers and regulators amongst others. Each of these clubs unites when their collective commercial and political interests are under scrutiny. This is traditionally the case when an aircraft crash is under investigation. A finding of fault can result in financial penalties both in the short and longer term. In the case of Swissair 111, Swissair was not *just* an airline. It was a national emblem of Switzerland's efficiency, excellence and propriety. There was a lot at stake and it cannot go unnoticed that within three years of the crash of Swissair 111, Swissair filed for bankruptcy and a criminal investigation was launched into whether Swissair's parent company acted illegally in amassing losses of 2.9bn Swiss francs ($1.7bn) in 2000.

The individual who guides IASA is a member of the most exclusive of clubs; a club whose membership is restricted to those who have lost loved ones in aviation disasters. Bureaucracy does not perturb such individuals nor are they intimidated by protocol or the customary *way of doing business*. Their motivation is to see that justice is done and the factors that contributed to the *needless* deaths of their loved ones are not imposed on other innocent individuals. As Chairman of IASA, Lyn has always strived to give a voice

to both the *technical* issues that brought Swissair 111 crashing down into the sea and to the *humanitarian* issues that surfaced as a result.

Whilst each faction has different resources at their disposal and is motivated by different interests, there is room for both. Indeed balance is critical in ensuring that all possible measures are taken regardless of *other interests*. What we have come to realize is there is much work to be done in this regard and until then it is the responsibility of organizations such as IASA to ask the difficult questions and put a human face to aviation safety.

Section 1
The Most Complex of Aviation Safety Investigations

The official investigation into the crash, carried out by the Transportation Safety Board of Canada (TSB), took four and a half years and cost in *excess* of $57m Canadian. When the TSB released their final report on March 27th 2003 they cited the investigation as '…the largest, most complex aviation safety investigation the TSB has ever undertaken'.

1.1 The Flying Coffin

The crash of Swissair 111 was not the result of a *single* failure. Immediately after the crash there was mounting speculation that a catastrophic electric failure aboard the seven-year old MD-11 was a likely culprit, however, as the investigation progressed it emerged that this was one of a number of factors that contributed to the crash. It should be noted that the 'catastrophic electric failure' encompasses five issues:

1. The specific wiring used aboard the aircraft.
2. The impact of maintenance practices on the aircraft's wiring.
3. The aging characteristics of the aircraft's wiring.
4. The configuration of the aircraft's wiring.
5. The installation and certification of the aircraft's In Flight Entertainment System (IFEN).

The catastrophic electric failure exacerbated other underlying shortcomings in the construction of the aircraft including the characteristics of the thermal acoustic insulation blankets (M-Pet) that lined the aircraft. After extensive flammability testing, the TSB determined that such blankets are 'susceptible to being ignited by small ignition sources, such as electrical arcing or sparking and will propagate a fire'[1].

The crash also highlighted the inherent dangers in Swissair's checklist procedures in the event of a smoke in the cockpit scenario and the widespread practice of resetting circuit breakers. Whilst the TSB was not able to ascertain the exact single cause of the crash, it did identify a number of safety deficiencies that contributed to it.

Although the TSB singled out insulation blankets as a major contributing factor, they also referred to arced wiring but could not state conclusively whether or not that wiring was associated with the in-flight entertainment system or *other* aircraft wiring. Given Kapton's susceptibility to arcing, the question remains if the Kapton wiring arced independent of the in-flight entertainment system or vice versa.

Indeed, their findings identified safety deficiencies that have directly affected hundreds of other aircraft from around the world. In all the TSB issued four Aviation Safety Advisories,

[1] TSB Final Report. Section 4.2.1.1 Other Thermal Acoustic Insulation Materials at Risk.

an Aviation Safety Information Letter and twenty-three Safety Recommendations. We have also detailed the failure of the FAA to act expeditiously with respect to Audio, Data and Video Recorders by way of example of the FAA's apparent reluctance to implement recommendations in a timely manner or at all.

Early on Lyn referred to the MD-11 aircraft in question as a "Flying Coffin". Although her comments were initially attributed to a widow's anger, in time many others realized that her use of this term was anything but ill conceived. The term has become synonymous with the crash of Swissair Flight 111 and accurately reflects the host of issues that downed the aircraft.

1.2 Humanitarian Issues

From a non-technical perspective, IASA also confronted a number of humanitarian issues. These included the proposed recovery by Lloyds of London of cargo from the crash site, the extent of DNA identification of human remains recovered from the crash site, the practice of erecting monuments in the vicinity of aircraft crashes, the procedures associated with the identification and return of the victims personal belongings to family members and finally the provision of information to family members on the part of regulators and investigators.

Section 2
Wired for Disaster

Swissair 111 *was* wired for disaster in five specific respects:

- The specific wiring used aboard the aircraft.
- The impact of maintenance practices on the aircraft's wiring.
- The aging characteristics of the aircraft's wiring.
- The configuration of the aircraft's wiring.
- The installation and certification of the aircraft's In Flight Entertainment System (IFEN).

2.1 The Specific Wiring – Aromatic Polyimide

The average jumbo jet has approximately 175 miles of wiring, some covered with a thin layer of insulation no thicker than three human hairs. One type of wire in particular has attracted the most attention; a general-purpose aromatic polyimide wire commonly known as Kapton. Kapton was trademarked by DuPont in 1966. Aromatic polyimide is the most commonly used wire insulation on many older Boeing and McDonnell Douglas airplanes that were built beginning in the late 1960s. It is lightweight, resistant to abrasion and cuts, is able to withstand high temperatures, and is flame and environmentally resistant. These properties were hailed as major breakthroughs when it was introduced in the late 1960s. But, within a few years, inherent dangers emerged. First, over time the insulation becomes brittle, allowing the conductor to be exposed. Second, the insulation is compromised if strict maintenance and installation practices are not observed. Third, prolonged exposure of this type of wire insulation to moisture can also cause it to deteriorate. In any of these three scenarios aromatic polyimide is susceptible to *arc tracking*.

Arc tracking can occur when two cracks in the insulation are close enough together to allow the current to form a conductive path between them at temperatures that can cause the insulation to char and carbonize. This carbonization can turn the insulation into an electrical conductor, and, eventually, can trip a circuit breaker. When a pilot presses the switch to reset a tripped circuit breaker, an entire wire bundle can be disabled and potentially compromise the safety of an aircraft's entire electrical system.

2.2 Data Mining

IASA set about gathering together as much data as possible in respect of aromatic polyimide wiring and soon realized the concerns stretched back *over* 20 years. This was not a problem confined to either the commercial or military realm both had data warning against its continued use and yet in spite of this it remained the wiring of choice in hundreds of commercial aircraft both in the United States and abroad.

Even the FAA had issued Advisory Circulars warning airlines of its susceptibility to arc tracking, for example:

> **Advisory Circular 25.16 dated April 5th 1991**
> Aging, weathering, vibration and the normal wear and tear of maintenance sometimes cause chafing, abrasion, or deterioration of insulation, which can cause cracks or cuts that can expose the conductor… service experience of aromatic polyimide insulation, as presently constructed, documents a failure mode called "insulation flashover" where conduction at insulation breakdown areas has damaged or destroyed the wire or wire bundle in which it occurs. Also, other adverse effects have sometimes occurred as a result of this failure mode. Arcing on wire insulation, or "arc tracking" can result from electrolytic contamination of wire having insulation cracks or cuts that expose the conductor. It can also result from chafing damage that reduces the dielectric strength of dry insulation.
>
> Whenever practical, aromatic polyimide insulation wires should not be used for high current carrying cables.
>
> **Advisory Circular 43.13-b dated September 8th 1998**
> Fracture of the insulation wall and penetration to the conductor of these materials by the stamping dies have occurred. Later in service, when these openings have been wetted by various fluids, serious arcing and surface tracking have damaged wire bundles.

These two documents along with many *many* others demonstrated not only that the FAA *knew* of the problem but as we shall see, were apparently reluctant to require a fleet wide removal of aromatic polyimide in spite of the growing data that it posed a threat to the safety of the flying public.

2.3 Military Experience of Aromatic Polyimide

In the mid-1980s, the Navy began experiencing problems with aromatic polyimide. In response, the Navy enlisted the assistance of experts from other military services and the Federal Aviation Administration (FAA) to better characterize the problems and develop possible solutions. Ultimately, FAA and each of the military services responded differently to the problems of aromatic polyimide.

The Navy started using aromatic polyimide in the mid-1970s, began noticing cracks and breaks in the topcoats of this insulation in 1980 and 1981, and undertook research to identify potential problems with its use. In 1984, researchers at the Naval Research Laboratory reported that moisture caused aromatic polyimide to break down when it was exposed to high humidity, moisture, or water for long periods of time. It also found that carbon deposits can form and build up between two cracks in this insulation after several arcing events, a process that ultimately trips a circuit breaker. When a pilot presses a tripped circuit breaker to reset it, an entire wire bundle can be disabled, potentially causing catastrophic results.

In December 1985, the Navy decided that aromatic polyimide would no longer be its wiring insulator of choice. Subsequently, the Navy selectively removed this wire insulation from parts of aircraft where it was most problematic, such as fore and aft flaps, wheel wells, and around unsecured seals that could leak. However, because the Navy still had a large supply of aromatic polyimide on hand, it continued its use on aircraft in areas

that were not vulnerable to water infiltration. The Navy also took delivery of some McDonnell Douglas aircraft in 1988 that were built with aromatic polyimide wiring insulation that had been purchased before problems with this wire insulation were recognized.

2.4 Mobilizing the Issue & House of Representatives Aircraft Electrical System Safety

IASA initially met with the FAA in Washington D.C. on May 18th 1999 to discuss, among other things, the susceptibility of aromatic polyimide to arc tracking and the practice of using circuit breakers as 'on/off' switches that in an arc tracking scenario can exacerbate the potentially deadly situation. At that meeting IASA referred the FAA to Advisory Circular 25.16 dated April 5th 1991. A further meeting was held on September 7th 1999 to assess what progress (if any) in respect of the matters raised at IASA's initial meeting with the FAA and also to discuss IASA's formal participation on ATSRAC. Representing the FAA Associate Administrator, Thomas E McSweeny and Beth Erickson, FAA Assistant Director Certification.

During that meeting an interesting comment was made by Beth Erickson in response to Lyn's concerns that four years given to airlines to replace M-Pet insulation blankets (See Section 3 below). Her response was that the four year requirement for compliance was needed to ensure that damage to the wiring did not occur in a rush to replace the insulation blankets. So… let aircraft continue flying laden with materials that are known to propagate fire in order not to exacerbate a problem, that as you will see, according to the FAA Associate Administrator the FAA *may not have had a large indication of safety problems*.

The meeting took place just *eight days* before the House of Representatives, Subcommittee on Oversight, Investigations and Emergency Management, Committee on Transportation and Infrastructure began hearings in respect of Aircraft Electrical System Safety in Washington, DC.

Amongst those who gave evidence was DR. Bernard Loeb, Director, NTSB Office of Aviation Safety. Dr. Loeb was unequivocal in his assessment of the widespread nature of the problem.

> **Dr. Loeb**. We also found wire bundles contaminated with semiconductive residues, metal drill shavings along the path where the center tank wiring was routed. In an effort to determine if these findings were unique to the Flight 800 airplane, or existed on other transport airplanes, the Board examined wiring on more than 20 other transport category airplanes and found accumulations of contaminants on wiring that included lint, grease, liquids, paper, metallic corrosion-inhibiting compounds, wire bundle clamps that cut into the wire when the rubber lining crumbles, shavings and cracks in the insulation of wire, deep enough to expose the conductor. These findings have raised the Safety Board's concerns about the safety of electrical systems as airplanes age. However, in recent industry meetings and seminars, operator personnel have questioned the merit of performing wiring inspections indicating that they have not detected significant discrepancies. This is certainly at odds with our findings.

The record also notes:

> **Dr. Loeb**. We have inspected at least 25 airplanes as a result of the TWA 800 investigation. Eighteen of these were airplanes that were essentially in the desert in

> moth-balled conditions, or sitting there waiting for disposition. They were older airplanes, many of them similar to the TWA Flight 800 airplane. In addition, however, we had an opportunity to investigate seven additional airplanes that ranked from relatively newer or brand-new airplanes to fairly new airplanes that were actually in service, but had experienced some sort of an event, an incident. In all of them, we found some anomaly, either metal drill shavings or lint, and other anomalies similar to that found in the TWA 800 airplane.
>
> **Mrs. Fowler**. So in all 25 planes that you inspected you found some type of problem with the wiring?
>
> **Dr. Loeb**. That is correct.

FAA Associate Administrator, Thomas E McSweeny, later took the stand and his comments together with those of Beth Erickson, FAA Assistant Director Certification, confused the situation. They confused the situation in the sense that their comments appeared to be at odds with what we as an organization had ascertained; that there was a problem stretching back many years and yet little or no pre-emptive action had been taken to mitigate it.

> **Mr. McSweeny.** We have really looked at wiring over the years. In the—in the early 80s when Kapton was introduced and people started seeing problems, we really focused on it deeply. We spent efforts with the manufacturers, looked at it. We created a program at the Tech Center to look at it. We've had lots of employees over the years looking at wiring. So we've really focused on it as an issue kind of at the beginning because of our requirements to oversee the safety of any product that's out there in service… In that vein, they [*White House Commission on Aviation Safety and Security*] also recommend today looking at wiring. We think that was a very appropriate recommendation because while we may not have had a large indication of safety problems up to that point, we really need to make sure that problems don't get introduced as the airplanes age.

While we may not have had a large indication of safety problems up to that point, we really need to make sure that problems don't get introduced as the airplanes age. Aromatic polyimide had been banned by the NAVY *fourteen years before* Mr. McSweeny's testimony and yet the FAA Associate Administrator, second-in-command, felt comfortable in saying that the FAA *may not have had a large indication of safety problems up to that point*. As mentioned above, this testimony is *confusing*.

As for the service life of aircraft wire, once again the McSweeny's testimony is at odds with the data.

> **Mrs. Fowler.** I think we have all agreed from the testimony here today, and I want to make sure you agree, that the noncomposite wiring that is used on aircraft today does have a service life limit.
> **Mr. McSweeny.** I would have to be honest and say I don't necessarily agree with that. I think that is still undecided. I think if you were to ask people like Mr. Bruning, he would probably say the same thing. In fact, he has said that to us in some of his correspondence. I think the issue is that we have to be open minded. And if we find evidence through this ATSRAC program or any other program that we do have to put a life limit on it, that's the time to make that decision. And we—right now, I think the key is, we're gathering data to make a data-driven decision and to keep our eyes wide open.

The NTSB's final report into the TWA800 crash refers to a *1997* Lectromec report that documented the aging of Kapton wire insulation in various locations in U.S. Navy P-3 airplanes. This report indicated that wire insulation in areas exposed to sunlight and moisture could reach the end of its service life (chemically) within *1 year*, whereas wire insulation in protected areas in the same airplane could survive for up to *10* years.

One of the battles we fought was getting the FAA to accept that whilst environmental and operations factors were critical, one also had to accept that different wires perform differently under such circumstances. Wire is not just wire in the generic sense. Beth Erickson confirmed this polarity in spite of the documented evidence, both from the FAA themselves [AC25.16 '*Whenever practical, aromatic polyimide insulation wires should not be used for high current carrying cables'* Please refer to Section 2.2 above] and countless others.

> Ms. **Erickson.** Congressman Oberstar, as you pointed out, many of the things that we have found in our inspection programs to date have pointed out that across the various types of wire, the main issues really are design, how the wires are installed, whether the bend radiuses are too tight, whether the clamps are holding them in place for the vibration kinds of issues, whether they're routed so they don't get fluid from lavatories dripped on them. And then also in the maintenance area, you've pointed out several problems that could occur.

Erickson also made the following comments in a CNN report appeared October 11th 2000[2] that appeared at odds with the prevailing data:

> "Cracked wires do not, in and of themselves, represent an immediate safety problem," Erickson said in a discussion of the agency's program to study aircraft wiring. But, she added, "they are of concern to us." Asked about reports that the cracked wiring found on the six retired airliners could mean some planes have hundreds of damaged wires, she insisted that assumption was incorrect. Those inspections targeted areas where wiring was under the most stress, areas where it was exposed to heat or cramped into a tight areas, she said. Those findings "can't be extrapolated to the whole of the aircraft," she said.

2.5 The Executive Office of the President

In response to the White House Commission on Aviation Safety and Security, the FAA formed a fact-finding committee in 1998 to evaluate the aircraft systems of the aging fleet and propose enhancements to current procedures. The Aging Transport Systems Rulemaking Advisory Committee (ATSRAC), which was composed of representatives from various segments of the aviation industry, focused its investigation on aircraft wiring. Although IASA was granted a non-voting role in ATSRAC the FAA felt that 'passengers rights are presently represented sufficiently'[3]. In spite of this IASA again met with the FAA on October 5th and November 23rd 1999.

IASA had anticipated a *lethargic* response from the FAA and accordingly had already attended meetings on May 18th 1999 as follows:

[2] FAA wiring study finds improvement needed
[3] Thomas McSweeny, Associate Director FAA.

- Executive Office of the President, Science & Technology Policy at the White House LSR, EB, AVDW, JK and JTL met with Lee Ann Brackett (Congressional Liaison) and Stephen G. Moran (Space & Aviation).
- Representatives of the National Transportation Safety Board (NTSB) Jamie Finch (Director, Government, Communications), Gary Abe (Deputy Director), Barry Sweedler (Director Safety, Recommendations), Steven Okun (Department of Transport, Deputy General, Advisor to the Secretary) amongst others.
- Candace Kolander (Coordinator, Air & Health) and Leah L. Porter, Ph.D. (Air Safety & Health Researcher) of the Association of Flight Attendants.

To add further momentum to the issue, IASA realized that like aviation safety, the safety hazards associated with aromatic polyimide wiring were a matter of *global concern*, accordingly IASA attended a series of meetings in Europe in November 1999 to galvanize the issue. Those meetings included:

- On October 4th and November 27th 1999 IASA met with representatives of the European Joint Aviation Authorities (JAA) prior to a series of meetings in Europe that would take Lyn across the Atlantic Ocean for the first time since Ray's death.

- On November 29th IASA appeared before the Chairman, Mrs. Gwyneth Dunwoody MP, and various other members of the United Kingdom House of Commons Select Committee on Transport. That meeting lead to a series of other meetings between IASA and Mrs. Dunwoody that culminated on December 9th 1999 with a series of formal questions being put to the then UK Secretary of State for Defence in respect of the UK experience of, among other things, aromatic polyimide.

- On November 30th 1999, IASA met with the Chairman of the UK Civil Aviation Authority, Sir Malcolm Field, Richard Profit (Group Director, Safety Regulation), C Phelan (Head of Avionic & Electrical Systems) and Michael Bell (Design & Production Standards Division). Among the matters discussed were the FAA's order to operators of 699 aircraft to replace Mylar insulation blankets within four years (FAA: APA 87-99 11/08/99), mixing of Wire Types and the need for an improved system to record incidents of Wire Failures.

IASA's May 18th 1999 meeting with representatives of the Executive Office of the President was the start of a long and fruitful relationship. The Clinton Administration had already started a review of commercial aviation with the July 25th 1996 creation of the White House Commission on Aviation Safety and Security (the Commission). The time was ripe for IASA to build on that commitment albeit we didn't know it at the time.

The Commission was assigned three specific mandates: to look at the changing security threat, to examine changes in the aviation industry, and to look at the technological changes coming to air traffic control. It was created on the heels of the July 17th 1996 crash of TWA800, a Boeing 747-131, near East Moriches, New York, that claimed the lives of all 230 people on board.

In terms of aromatic polyimide wiring, although it wasn't known at the time, the NTSB's investigation of the crash of TWA800 would reopen the Kapton debate. When the NTSB delivered their final report on August 23rd 2000, the aging and *arcing* characteristics of aromatic polyimide were again front page news. The NTSB had hired Lectromechanical Company (Lectromec) to conduct laboratory research into the short-circuit behaviors of

aromatic polyimide. Lectromec reported that it was susceptible to strong, energetic, arcing.

As discussed, IASA first met with representatives of the Executive Office of the President on May 18th 1999. That meeting, and those that took place subsequent to it, namely on December 10th 1999 and February 3rd 2000, set the stage for what would be a turning point in the aircraft wiring issue. The latter meeting culminated in the Executive Office of the President taking unprecedented action.

On May 10th 2000, the Executive Office of the President released a memo stating:

> As a result of a review of existing research and wire safety efforts underway at FAA, DOD, and NASA and recent White House meetings including representatives of the International Aviation Safety Association, Lyn Romano and Edward Block, we have concluded that aging wiring is an issue of national concern that extends beyond aviation. Therefore, we are proposing to form an Wire Safety Research IWG that will become the focal point for wire safety technology in the U.S. This group will be responsible for ensuring that federal research is coordinated and communicated in a timely way to improve safety for air, space and other areas where aging wiring is a safety issue.

At the time of the memo's release, preparations were underway for a symposium IASA would host in New York on November 17th/18th 2000. The symposium would bring together a host of experts from across the world and Charles Huettner, the President's Senior Advisors on Science & Technology, not only agreed to speak at the symposium but to chose it as the venue to deliver the Wire Safety Research IWG report 'Review of Federal Programs for Wire System Safety'.

The issue of aircraft wiring was high on the political agenda.

2.6 The TSB August 28th 2001 Flammability Recommendations

On August 28th 2001, the TSB issued Aviation Safety Recommendation A01-03 that required a certification test regime to evaluate aircraft electrical wire failure characteristics under realistic operating conditions and against specified performance criteria, with the goal of mitigating the risk of ignition.

In light of the formation of the May 10th 2000 formation of the Wire Safety Research IWG, the August 23rd 2000 NTSB report into the crash of TWA800 and the TSB's three Aviation Safety Recommendations issued on August 28th 2001, IASA made arrangements to meet with the FAA in September of 2001.

2.7 911

The terrorist atrocities of September 11th 2001 are a seminal moment in our history. Not only did the heinous acts claim the lives of some 2800 people and leave thousands more to struggle to build their lives without their loved ones, but the world would never be the same place again. It soon became apparent that there were serious, and as it transpired *deadly*, flaws in the FAA's regulation of aviation security. As in the case of aircraft wiring, serious discrepancies in the security of our nation's airports had been the subject of many reports prepared by the Office of the Inspector General (OIG) and the General Accounting Office (GAO), and yet lessons were not learned and warnings were *not* heeded. It took the lives of the innocent for *something* to be done. The formation of the

Transportation Security Administration heralded a new era in aviation security, one that the FAA was to play *no* part in.

Prior to the September 11th terrorist atrocities, the FAA had often been accused of possessing a 'tombstone mentality'. Those who criticised the FAA would point to its propensity to *react* instead of being a *proactive* advocate of safety and efficiency. To those who chastised the critics, we have no comment.

2.8 Post 911

As a nation, we needed to respond to the dire anomalies that characterized our aviation security infrastructure. IASA did and to this day is in complete agreement. However, such efforts must be in *addition* to other initiatives that have the sanctity of human life uppermost in its minds. The tomes of data warning of the dangers inherent in aircraft wiring ultimately translates to more needless deaths *if* something isn't done about it. IASA was told in no uncertain terms in 2001 that as far as the TSB's August 28th 2001 recommendations were concerned *nothing would happen*. All one had to do was look to the newspapers for confirmation, on the day the TSB released their recommendations an FAA spokesperson stated that the FAA was *unlikely to act on the TSB's recommendations*. As much as it saddens us as an organization, there are those who do not respect human life to the same degree we do.

2.9 NASA Takes the Torch

As with the May 18th 1999 meeting with representatives of the Executive Office of the President, an unexpected source of assistance was to come IASA's way. The Wire System Safety IWG was co-chaired by William J. Harris of the National Aeronautics and Space Administration (NASA). IASA soon realized that NASA took the issue of wiring to new heights. Not only was NASA at the forefront of emerging technologies aimed at detecting wiring defects *before* they resulted in a serious incident or accident, they were also willing to 'open their doors' to IASA.

On May 29th 2002 Lyn Romano was invited to Kennedy Space Center to inspect the wiring of the space shuttle Discovery while the Shuttle was in a 20-24 month maintenance mode. Lyn kept a journal of her time at KSC, and states in respect of her first day:

> This clarified for me just how I ended up at NASA. I suppose I was meant to witness first hand how NASA is addressing the wiring concerns they have been confronted with, in order to see for myself what they had been telling me for several months, since my initial communication with the gentleman at JSC. What was he telling me? Specifically, NASA is most concerned with providing the human beings that board their shuttles the highest level of safety humanly possible. The safety they deserve. We all know disasters happen, BUT, when there are means to ensure the safest possible environment, either in the commercial aircraft realm or the space shuttle realm, they need to be aggressively undertaken, something NASA has chosen to act on and not just talk about. Talking about it, rather then acting aggressively seems to be the course the commercial realm of aviation has chosen instead.

To be *proactive* is to act in a manner commensurate with a genuine desire to protect human life. It is not enough to hide behind 'cost benefit analysis', the formula used in assessing the feasibility of a particular safety enhancement that weighs the *perceived*

benefit against the *monetary investment* required to implement it. In other words, even life has its price.

What NASA did was afford us an organization the opportunity to see best practice in operation. Again quoting from Lyn's journal:

> As I look around the mid-body section, I can see how much attention is being paid to ensure the bend radius of the wiring is smooth, as it "snakes" its way up, around and through the craft. Adequate wire separation is also apparent. This being a very "hot topic" item of discussion in the commercial aviation realm recently, I was quite impressed to see this vital safety enhancement already being tended to by NASA. The pristine conditions stunned me.

As an aside, we would like to take this opportunity once again to thank Bill Harris and Steve Sullivan for allowing us the opportunity to witness first hand your tireless dedication and commitment to excellence. In our opinion, you set the standard that those in the commercial realm would be wise to adopt.

2.10 A Piecemeal Approach to Aircraft Wiring

The FAA started in the way they have continued; a piecemeal approach to the problems associated with aromatic polyimide. In 2004 alone the FAA issued five dockets that all relate to wiring and yet there is no sign of a comprehensive all-encompassing program to eradicate the problem.

- October 27th 2004- FAA issued Docket No. 2003-NM-69-AD requiring 'an inspection to detect arcing damage of the surrounding structure of the terminal strips and electrical cables in the avionics compartment, and repairing or replacing any damaged component with a new component.'
- Effective December 14th 2004 – FAA issued Docket No. 2001-NM-54-AD stating the 'actions specified by this AD are intended to prevent moisture from entering through the rear of the connector of the ODUs located in the overhead baggage stowage racks, which could result in a short, damage to the connector pins, and consequent smoke and/or fire in the cabin'.
- Effective December 14th 2004 – FAA issued Docket No. FAA-2004-18572 'prompted by arcing between a power feeder cable and terminal board support bracket. We are issuing this AD to prevent arcing damage to the power feeder cables, terminal boards, and adjacent structure, which could result in smoke and/or fire in the cabin.'
- Effective December 14th 2004 – FAA issued Docket No. 2000-NM-32-AD 'intended to prevent electrical shorting of the brake coils of the ATS, which could result in smoke in the cockpit and/or passenger cabin'
- Effective December 14th 2004 – FAA issued Docket No. FAA-2004-18573 'prompted by an incident in which arcing occurred between the power feeder cables and support bracket of the terminal strips. We are issuing this AD to prevent arcing damage to the terminal strips and damage to the adjacent structure, which could result in smoke and/or fire in the mid-cabin compartment'.

To put the MD-11 into context, to our knowledge the MD-11 is the subject of more ADs than any other transport category aircraft in respect of electrical wiring problems and electrically stoked smoke and fire threats.

2.11 Request

To this day the FAA has *not* mandated a certification test regime to evaluate aircraft electrical wire failure characteristics *under realistic operating conditions* and *against specified performance criteria*.

On this day seven years since the *needless* loss of 229 innocent people we renew our request for the FAA to act on the TSB's August 28th 2001 recommendations.

Section 3
Thermal Acoustic Insulation Blankets

Thermal acoustical insulation blankets are widely used in the aviation industry to protect the aircraft interior from temperature variations and noise. The Swissair MD-11 was primarily fitted with metallized PET (M-Pet). M-Pet covered Mylar insulation blankets are used throughout the MD-11 aircraft, including extensive use in the ceiling area forward and aft of the cockpit bulkhead. On October 14th 1998 the FAA stated that the test criteria used to certify the flammability characteristics of thermal acoustical insulation materials were inadequate, and committed itself to conducting the research necessary to establish a more comprehensive test standard.

As discussed in Section 1.1 above, The catastrophic electric failure exacerbated other underlying shortcomings in the construction of the aircraft including the characteristics of the thermal acoustic insulation blankets (M-Pet) that lined the aircraft.

3.1 FAA's Flammability Test of Mylar Misleading

After extensive flammability testing, the TSB determined that such blankets are 'susceptible to being ignited by small ignition sources, such as electrical arcing or sparking and will propagate a fire'[4].

Accordingly, on August 11th 1999, the TSB issued Aviation Safety Recommendation A99-07 noting 'it is likely that MPET cover material was a significant source of the combustible materials that propagated the fire' and 'that the operation of aircraft outfitted with thermal acoustical insulation blankets incorporating MPET cover material constitutes an unnecessary risk.' The TSB recommended that regulatory authorities confirm that sufficient action is being taken, on an urgent basis, to reduce or eliminate the risk associated with the use of MPET-covered insulation blankets in aircraft.

On the same date the TSB issued Aviation Safety Recommendation A99-08 requesting regulatory authorities to validate all thermal acoustical insulation materials in use, or intended for use, in applicable aircraft, against test criteria that are more rigorous than those in Appendix F of FAR 25.853 and that are representative of actual in-service system performance.

The recommendations are similar to those subsequently issued on August 28th 2001 in respect of aircraft wiring (See Section 2.6 above) in that they refer in this instance to *actual in-service performance* and in respect of the former to *realistic operating conditions*. In other words, laboratory testing is acceptable provided it correlates to the real world performance of these materials. A Bunsen burner is *not* the same as an in-flight fire thirty thousand feet above the Atlantic Ocean.

[4] TSB Final Report. Section 4.2.1.1 Other Thermal Acoustic Insulation Materials at Risk.

3.2 Selected Incidents of Mylar Propagating Fire aboard Aircraft

In Appendix A of their final report, the TSB cited five accidents representing 'selected occurrences in which M-Pet insulation blanket cover material was involved'. It should be noted that these are *representative* of the problem and represent a sample of the many incidents in which M-Pet insulation blankets have propagated fire.

1 **November 24th 1993**: a McDonnell Douglas MD-87 experienced a fire while taxiing. Initially, the smoke emerged from the aft right side of the cabin. After the passengers and crew had disembarked, the fire intensified dramatically and spread quickly. Investigators determined that the M-Pet covered insulation blankets acted as fuel sources that helped to spread the fire. [Aircraft Accident Investigation Board, Denmark]
2 **September 6th 1995**: a McDonnell Douglas MD-11 experienced a fire in the Electronics and Engineering bay. Investigators found that molten metal from arcing wires had fallen on M-Pet covered insulation blankets adjacent to the fuselage skin causing extensive flame propagation and widespread fire damage. [Minister of General Administration of Civil Aviation of China, People's Republic of China]
3 **November 26th 1995**: a McDonnell Douglas MD-82 experienced a cabin fire prior to take-off. A ruptured light ballast case ignited a fire, which spread rapidly with extensive flame propagation on the M-Pet covered blankets. [Civil Aviation Department, Republic of Italy]
4 **November 8th 1998**: a fire broke out during loading operations of a McDonnell Douglas MD-11. Indications are that a cargo pallet was inadvertently pulled over an electrical cable that supplied power to one of the cable deck floor rollers. A box containing electronic circuitry sparked, which ignited a nearby September 6th 1995 covered insulation blanket. [National Transportation Safety Board, U.S.]
5 **March 29th 1999**: a McDonnell Douglas MD-11 freighter undergoing maintenance was discovered to have insulation blanket material displaying evidence of fire damage. Preliminary investigation results reveal that chafed wires, located under the floorboards of the aft cargo compartment, had arced, causing nearby M-Pet covered insulation blanket to ignite. The fire propagated to cover an area of insulation blanket of approximately 60 inches by 26 inches. [National Transportation Safety Board, U.S.]

The September 6th 1995 incident is of particular note in determining the adequacy of the FAA's response to the problem. In a report dated 24 May 1996, which was forwarded to the FAA, the Civil Aviation of China (CAAC) recommended that the manufacturer be advised, "the insulation blanket installed in the Boeing 737-300, [and] MD-11 airplanes is fire flammable. They should make a prompt and positive response."

In a response to the CAAC report dated 24 July 1996, the FAA stated that they intended to investigate the behaviour of insulation blanket materials under larger scale conditions. The FAA also stated that, while the tests conducted by the CAAC on the PET were illustrative, the type of CAAC testing conducted (igniting at the sewn edge of the sample material) was not required for certification.

In the context of the FAA's October 14th 1998 statement (above) that "the test criteria used to certify the flammability characteristics of thermal acoustical insulation materials were inadequate", one has to ask precisely what did the FAA do in response to the CAAC correspondence? Many have wondered if the fate of the 229 people aboard Swissair Flight

111 might have been different had the FAA responded more robustly to the CAAC on July 24th 1996.

3.3 IASA's Response

As with the wiring issue, IASA first gathered together all available data before taking our findings to the FAA. We directed correspondence to the FAA and obtained from them copies of the CAAC correspondence. Whilst we had anticipated that the FAA response would be *lethargic* at best, we had not anticipated just *how* lethargic.

As noted in Section 2.4 above, the FAA initially gave airlines four years to remove M-Pet insulation blankets, however, if this was not *bad* enough this was subsequently extended to *five* years. However, the M-Pet *fiasco* is made all the more alarming by virtue of a seemingly innocuous question IASA put to the FAA seeking an update as to how many of the hundreds of affected aircraft had removed the M-Pet insulation blankets. The answer *we do not routinely monitor each airline's compliance with Airworthiness Directive … although we have the ability to do so, we trust that they do*. Is this the approach that was adopted with Alaska Airlines? Trust? A *Regulator* should *Regulate* and to regulate means to take a proactive lead in ensuring not only that it tackles problems before they turn into disasters but making sure that when it does mandate action it consistently monitors action taken in response to it. Otherwise is makes a mockery of the title of 'regulator'.

The FAA issued two NPRMs (99-NM-161-AD and 99-NM-162-AD). The NPRMs proposed the removal of MPET-covered insulation blankets from all US-registered aircraft. The final rule regarding these proposals came in May 2000 when the FAA issued two ADs (AD 2000-11-01 and AD 2000-11-02). On July 31st 2003 the FAA issued a revised final rule allowing airlines until September 2nd 2005 to comply. Considering the TSB recommendations were issued on an 'urgent basis' it is alarming to us that it will be six years from the date of the recommendation to compliance and that unfortunately is not the end of this issue.

In September 1997, one year prior to the crash of Swissair 111, the US Department of Transportation published a document titled Evaluation of Fire Test Methods for Aircraft Thermal Acoustical Insulation5 stating:

> This report presents the results of laboratory round robin flammability testing performed on thermal acoustical insulation blankets and the films used as insulation coverings. This work was requested by the aircraft industry as a result of actual incidents involving flame propagation on the thermal acoustical blankets. . . . The grade of metallized PET film evaluated in this round robin is flammable and possibly could propagate a fire in a realistic situation.

In other words, when subjected to a test that reflected actual experience, the FAA's text reflected the reality of flammable events.

The deadline for compliance, June 30th 2005, has been and gone and to this day we are not certain whether all affected aircraft have removed the M-Pet. It is the case that many of the affected aircraft were likely sold to third world and emerging economies, while others were converted into cargo aircraft, however, for the FAA to take close to *nine years* to address a problem that was brought firmly to its attention by the CAAC is *alarming* to say the least.

[5]DOT/FAA/AR-97/58

Section 4
Audio, Data and Video Recorders

The TSB conducted a four and a half year - $57 million Canadian dollar investigation – and issued 4 Aviation Safety Advisories, 1 Aviation Safety Information Letter and 23 Aviation Safety Recommendations[6]. As noted above, one set of recommendations (A99-01 through –04, March 9th 1999) appears on the NTSB's 'Most Wanted List' in respect of NTSB recommendations A99-16 through 18:

> Audio, Data and Video Recorders - Recommendations specify at least two hours of audio recording capability, back-up power sources, and a requirement for video recorders in the cockpit to give investigators more information to solve complex accidents. Status: The Board noted some progress by the FAA on a few recommendations in this issue area but retained the overall classification of "Open-Unacceptable Response".

As previously stated, we raised this issue with the NTSB on October 14th 2003. Chairman Conners supplied us with a copy of their Recommendation Report (RR) in respect of these recommendations – the RR monitors and details in chronological order the progress of a recommendation and significant developments from inception to date (in this instance to February 11th 2004). It demonstrates the NTSB's robust approach to the recommendations it issues. We have included a copy of the RR in question for your reference[7]. We would draw your attention to the following entries:

> 3/19/1999 FAA agrees with these safety recommendations and will issue a notice of proposed rulemaking (NPRM) by the end of summer 1999.
>
> 5/24/1999 Pending publication of the final rule, A-99-16, 17, and –18 are classified "open – acceptable response".
>
> 8/11/1999 The FAA plans to issue the NPRM to address the CVR/DFDR issues in A-99-16 through –18 by March 2000. Although the proposed issue date has slipped, the FAA still intends to meet the compliance dates recommended by the Board for both rules.
>
> 4/16/2001 The FAA has assembled a team to begin drafting the NPRM, and it is anticipated the NPRM will be issued by the end of 2001.
>
> 7/25/2001 The Safety Board considers the issues related to the vehicle recorders as critically important to transportation safety and notes that these recommendations are on the list of Most Wanted Transportation Safety

[6] See Appendix 1
[7] See Appendix 2

> improvements. The Board regards it as unacceptable that little progress has been made in the 2 years since the recommendations were issued. Although the FAA appears to be moving to implement the recommended actions, the Board is skeptical that the dates for final action can be met. The Board urges the FAA to act expeditiously on these recommendations and to take necessary actions to expedite the final rule, such as informing industry of impending changes. Pending issuance of the NPRM and expeditious issuance of the final rule, Safety Recommendations A-99-16 through –18 are classified "Open--Unacceptable Response".

According to the 2003 DOT Report to Congress on Significant Rulemakings the anticipated publication date for a NPRM was February 9th 2003, however, the 2004 Report projects the publication date as January 16th 2005. For completeness, the November 16th 2004 Executive Order Submissions Under Review confirms that the Office of Management and Budget, the Executive Office of the President received AH88, on September 16th 2004. Considering the FAA originally agreed to issue a NPRM by the end of summer 1999, the FAA, based on its current January 16th 2005 projection, will be approximately 5 ½ years late in issuing the NPRM. This is appalling considering the NTSB anticipated implementation of the recommendation A-99-17 on or after January 1st 2003.

As if this wasn't bad enough, certainly in respect of A-99-17 this was not a new issue. Flight Standards Information Bulletin for Air Transportation (FSAT) 97-09[8] dated August 5th 1997 states:

> The FAA believes that resolution of this issue lays in new technology CVRs with increased taping capability. The NTSB agrees with this approach, and has made an additional recommendation, A-96-171, which would require that all newly manufactured CVRs intended for use on airplanes have a minimum recording duration of 2 hours. The FAA has indicated that it will revise the existing Technical Standard Order (TSO) C123a, Cockpit Voice Recorder System, to reference the standard for a 2-hour CVR as a requirement.

You will see from the balance of FSAT 97-09 that it notes issues concerning recorders that touch on the NTSB's recommendations. The FAA have sought to justify the lack of progress on this issue by reference to NTSB's recommendations A-99-28 through –29 (as they apply to the Boeing 737), however, considering these recommendations were issued April 16th 1999 this does not justify a delay in excess of 5½ years.

[8] See Appendix 3

Section 5
In-Flight Entertainment System

In May 1996, Swissair entered into an agreement with IFT to install a then state-of-the-art IFEN system into 16 MD-11 and 5 B-747 Swissair aircraft. In the agreement made with Swissair, IFT was responsible for all aspects of integrating the IFEN system into all Swissair MD-11 and B-747 aircraft, including the system-to-aircraft integration design, system certification, hardware installation, ongoing support, training, and continuing airworthiness. Santa Barbara Aerospace (SBA) to perform the FAA certification services, in its capacity as an FAA-approved Designated Alteration Station (DAS). In certifying the STC, SBA had been delegated the authority (by the FAA) to act on behalf of the FAA. FAA procedures required that a DAS submit a Letter of Intent (LOI) for each STC project, describing the project in sufficient detail to allow the FAA to determine what level of FAA involvement and oversight would be appropriate.

The FAA received the LOI for the Swissair project from SBA on 23 August 1996, and in accordance with established procedures, assigned an FAA team to review the LOI to determine the appropriate level of FAA involvement. Following their initial review of the LOI, the FAA contacted SBA to advise them of two additional test requirements necessary to certify the IFEN system. The first test involved assessing the crashworthiness of the associated new seat trays; the second involved assessing the flammability of IFEN-related materials being added within the cabin. On 3 October 1996, SBA submitted an amended LOI to the FAA incorporating the additional test requirements. The initial LOI was stamped "FAA Accepted" on 8 October 1996.

Based on the proposed IFEN system as described in the LOI, the FAA determined that SBA was capable of conducting the STC approval process. The FAA expected that SBA would inform them of any subsequent changes to the scope of the project, and that SBA would request FAA expertise as required. Other than those mentioned above, SBA did not submit any written changes to the LOI as the project evolved. In the configuration that was certified, the IFEN was connected to aircraft power in a way that was incompatible with the MD-11 emergency electrical load-shedding design philosophy and was not compliant with the type certificate of the aircraft. The FAA Los Angeles Aircraft Certification Office (LAACO) was responsible for regulatory oversight of SBA, which it accomplished by monitoring individual SBA DAS projects, and by conducting evaluations.

During the review of the IFEN system installation documentation, various discrepancies were noted in the approved drawings and supporting documentation prepared by HI. Examples of discrepancies include conflicting information between drawings, incorrect wire and pin identification, and incorrect references to other documents. The information contained in the STC-approved type design data package did not contain sufficient detail to completely define the IFEN system installation configuration.

The TSB concluded that FAA's designee program did not ensure that the designated alteration station employed personnel with sufficient aircraft-specific knowledge to appropriately assess the integration of the entertainment system's power supply with aircraft power. In response to the Canadian report, in 1999, FAA investigated its oversight of the designated alteration station involved in the crash and concluded that FAA's oversight of the designee that installed the entertainment systems was in accordance with FAA policy.

However, the report went on to note that aspects of FAA's policy for overseeing designated alteration stations lacked clarity and needed revision. To address this problem, the report recommended a nationwide study of FAA's oversight of designated alteration stations. This subsequent study, conducted in 2000, found general oversight weaknesses, including the lack of a national standard policy on management and oversight of designated alteration stations and a general lack of FAA supervision of these designees. To address the root cause of the problems identified, the 2000 study recommended revisions to FAA's order concerning oversight of designated alteration stations, which were made and issued in August 2002.

The 2000 review further recommended that the office establish a process to periodically assess the effectiveness and applicability of existing policies concerning designated alteration stations and consider feedback from FAA field offices and designees. The Aircraft Certification Service has not implemented this recommendation to directly assess the policies in place, but continues to rely on informal feedback from FAA field offices and industry.

Section 6
The Human Side of IASA

As we set out in the Foreword, in an arena dominated by regulatory and commercial interests, a force was needed that could work through the myriad of technical data and make a meaningful contribution to that debate whilst tending to the human issues that aviation safety encompasses. For this reason, IASA has tackled humanitarian issues that are as critical as the technical issues we have confronted and championed.

6.1 The Chief Medical Examiner & Ray's Wedding Ring

Lyn had *dealings* with Dr. John Butt, Nova Scotia's Chief Medical Examiner, soon after the crash and learned the hard way that even the most simple of requests would be dealt with in what she considered to be a less than compassionate manner. Her husband's wedding ring, inscribed with the words 'Love Lyn 10/3/81' was to become the subject of a bitter battle with the Chief Medical Examiner.

Lyn knew the ring would be recovered in spite of those who counselled that it would *never* be recovered. When it *was* recovered, it seemed that finding it was the *easy* part. Getting the Chief Medical Examiner to part with it was another matter entirely.

In his wisdom, the Chief Medical Examiner had deemed that the ring was evidence and accordingly it could not be released. Suffice it to say, Lyn made her position equally clear:

> 'If need be I'll bring CNN with me when I head to Nova Scotia and I'll "chain myself" to Shearwater's fence. If necessary I will rent an apartment in Halifax and be away from my family for six months if that's what it takes.'

Several members of the Royal Canadian Mounted Police were instrumental in 'assisting' the Chief Medical Examiner to reconsider and the ring *was* returned to its new owner.

Lyn would like to thank those who stepped in on her behalf and made it possible for her to obtain what was rightfully hers.

6.2 The Identification of Human 'Remains'

It is an aspect of an aircraft crash that is rarely discussed in the full glare of the media, however, in the case of Swissair 111 Lyn had no choice other than to tackle this *issue* in this manner, especially due to the media's often gruesome and unrelenting fascination with this very difficult aspect of the crash.

We accept that there needs to be certainty that the victims of an aircraft crash are identified, however, how far should identification go? Is it the case, that we merely *confirm* the victims' identities? Or is the case, that we should use those resources in

respect of every human 'remain' that is recovered? This has been the source of the most trauma for Lyn and her family and to IASA as an organization. It is a debate that has a strong odour of *costs benefit analysis*[9] about it.

The discovery of deoxyribonucleic acid, or DNA, the deciphering of its structure, and the decoding of its genetic information marked a seminal moment. In the case of the September 11th terrorist atrocities in New York, an abandoned 3000-acre landfill on Staten Island, N.Y., known as Fresh Kills, became the country's largest DNA lab. The Department of Forensic Biology in the Office of Chief Medical Examiner (OCME) in New York search for the *tiniest* remnants of human tissue, teeth and even hair to aid the identification process. The OCME extracts the DNA from *each* of the remains recovered, and those extracts are then shipped off to the DNA typing and profiling labs.[10]

Each of the remains recovered. *Each*.

So why were the same standards *not* applied in respect of the two hundred and twenty-nine people who perished aboard Swissair 111? Why was it decided that once those on board were *identified* and the more *significant* remains were typed and profiled were the balance of human remains worthy only of a mass grave?

Dignity. Dignity is an issue that has driven Lyn throughout this horror. Not her *personal* dignity but the *dignity* of those whose shattered bodies were scooped up from the bottom of the Atlantic Ocean. There will be those who may find our use of language *harsh*, however, the realities of an aircraft crash are *harsh* and *harsh* decisions are made by those who wield the power of *yes* and *no.*

A *mass grave* is harsh and in our opinion lacks the *dignity* that all those on board Swissair 111 deserved.

Sadly, not even the intervention of Cardinal John O'Connor of the New York Diocese proved successful. As CNN remarked in their tribute to Cardinal O'Connor at his death on May 4th 2000 he was 'a national figure, sought out by U.S. presidential candidates and world leaders and considered Pope John Paul II's most important American ally. Lyn sought Cardinal O'Connor's help in February 1999 and he was moved to lend whatever assistance he could in getting the Chief Medical Examiner to listen to her pleas.

Much to her shock, she was granted a one-on-one meeting with Cardinal O'Connor in June of that year. She can never put into words how touched she was then and how touched she remains to this day.

Unfortunately, Lyn did not succeed in her battle for dignity in this respect; however, she used every resource at her disposal in trying to.

We would like to express here our eternal gratitude to Cardinal John O'Connor for his compassion and humanity. The private counsel and public steps he took on her family's behalf were a light in what was otherwise darkness.

May Cardinal O'Connor rest in peace.

[9] See Section 2.9 Above
[10] Criminalistics Richard Saferstein Eight Edition, Pearson Educational International.

6.3 A Most Valuable Cargo

But there was another, seemingly more *valuable cargo* and as with the DNA issue and Ray's wedding ring, was to cause much pain not only to Lyn and her family but to others whom lost loved ones.

Swissair 111 was not only carrying passengers but also one kilogram of diamonds and 4.8 kilograms of jewelry worth $300 million on behalf of the jeweller of jewellers Harry Winston. Lloyds of London, a group IASA met on November 30th 1999 in between meetings at the House of Commons and the UK Civil Aviation Authority, albeit on an unrelated matter, insured the consignment. In the spring of 2000 it emerged Lloyds of London had requested permission to search the crash site in an effort to recover this most valuable cargo.

IASA mounted a vocal and vigorous objection on humanitarian grounds and later that month Lloyds of London issued a statement claiming that it would *never* mount a dive at the site.

There were those in the media whom supported the proposed dive, after all, the Province of Nova Scotia would be able to claim 10% in fiscal terms of any such recovered cargo. As a 'journalist' wrote in The Daily News[11]:

> Natural Resources Minister Ernie Fage had better think twice before rejecting more than £30 million in provincial revenue out of ill-considered sympathy for relatives of those who died aboard Swissair 111.

Ill-considered sympathy on whose part? The Natural Resources Minister or The Daily News?

Such persons clearly lacked the necessary compassion to realize that the Ocean floor was and is considered sacred ground to those left behind. To some, including Lyn, their *cargo* was far more valuable than Harry Winston's.

Dignity was again at stake.

6.4 The Memorial

We are all different. It is those differences that make the world an interesting place. This country is one where freedom of speech is a cornerstone of our way of life and where the rights of an individual are not readily discounted.

Different people have different ideals; they have their unique aspirations, needs and history. Free will is something our society encourages us to attain. Yet in the case of plans to erect a monument near the site of the Swissair crash, it seems an individual's rights were viewed as confrontational and an unnecessary *distraction*.

This is what we do. There is a tragedy. We wear black and we erect a monument. We mourn and then we *move on*. Closure and Denial are the present day wonder cures for all that is wrong with the world. We *follow suit* otherwise we are perceived as *strange*, *unreasonable*, *difficult* or in need of *professional intervention*. Why exactly is that?

[11] Diamonds in the Rough. May 21st 2000. The Daily News.

Those we love are individuals. We know them. That is what *love* is all about. So in order to represent them, our reference is *them*. We have to do all that we can to ensure that their wishes, as we know by virtue of our relationship with them, are carried out. That is what we *should* do. It is the *right thing to do*. Isn't it?

Why is it then that Lyn was regarded as *strange*, *unreasonable*, *difficult* or in need of *professional intervention* when she asked that Ray's name *not* be etched into the memorial stone. She was not objecting to others' wishes and rights to erect a monument to *their* loved ones. She was exercising Ray's wishes to the best of her abilities and *knew* that *he would not want his name there*. It really is *that* simple.

Lyn had to enlist the assistance of Judge Lorne Clarke and after many agonising months received confirmation that her husband Ray's name would *not* appear at the memorial. Lyn was not alone though.

Tara Fetherolf was sixteen when she took her seat on Swissair 111. Tara's parents, Barbara and Mark Fetherolf, also successfully blocked attempts to have it etched on the memorial.

Barbara has become an aviation safety advocate in her own right and has acted as a conduit for the dissemination of vast amounts of aviation safety data that would have otherwise remain scattered across the Internet. We have always held Barbara in the highest possible terms and esteem and she has proved to be an enduring source of support for Lyn on a personal basis. We take this opportunity to commend Barbara both on a professional and a personal level.

Section 7
Dignity

Things have moved on. Swissair 111 came and went. The news media are no longer interested in that Canadian crash. A crash that the FAA was loathed to consider anything other than an *international* or a *Canadian incident*. It didn't matter that the plane took off from the US nor that the aircraft was manufactured and certified in the United States (US) in accordance with applicable Federal Aviation Regulations (FAR). No, the FAA proudly announce that 1998 had been one of the safest on record… and chose *not* to include the deaths of two hundred and twenty nine people aboard Swissair 111 in its end-year *celebrations*.

Dignity.

That word again.

No *dignity* in dealing with the technical issues that brought Swissair 111 down.

No *dignity* in the humanitarian issues that were forced on to those who lost loved ones in the crash of Swissair 111.

IASA stands for Dignity and giving a voice to both the *technical* issues that brought Swissair 111 crashing down into the sea and to the *humanitarian* issues that surfaced as a result.

May the two hundred and twenty nine people, including my husband Raymond M Romano, who perished in the September 2nd 1998, crash of Swissair 111 rest in peace.

Mrs. Lyn S Romano
Wife of Raymond M Romano
Passenger Swissair Flight 111
Seat 9f
Chairman International Aviation Safety Association (IASA)

Prepared by Adam Smyth, IASA Europe, drawing on seven years of invaluable input provided by John Sampson, IASA Australasia, of both a technical and human nature. IASA wishes to thank Randy M. Romano (Ray's son) for not only creating the background page for this retrospective, but also the text appearing on that page.

Epilogue
Our Wings Encompass All

As you will appreciate this Seven Year retrospective is a mere glimpse into some of our more publicized work and specifically deals with the work related to Swissair 111. Through our website, our network of contacts and the many people that contact us on a daily basis from all over the world, we have also lent our assistance to other areas of aviation safety; cabin air quality, bird strike hazards and rudder issues to name but three.

We have also been called upon as an organization to speak on television and for print media interviews. Sometimes these interviews have been as a result of developments arising from Swissair 111, however, we are often contacted by the media when other aviation disasters occur. We invite you to take a stroll through the IASA In The News section at our website for more information.

But IASA is more than an aviation safety organization.

One very significant step taken by Mrs. Romano, only months after her husband was killed in the crash of Swissair Flight 111, was to establish the Raymond M. Romano Scholarship Fund through Pace University. Ray was completely dedicated to young adults as well as a staunch supporter of higher education. He volunteered through Junior Achievement where he taught accounting classes at the middle school level. It was Lyn's way of carrying his passion towards education forward. To date, there have been many recipients of the Raymond M. Romano Scholarship award, something we all know he must be very proud of.

Putting a human face to aviation safety has made us realize that as an organization we need to take under our wings other deserving causes. Heavenly Brickks is our way doing just that. Whether it is the Community Care Network Society, Support Connection or the Richmond Children's Foundation (to name but a few), IASA is there to lend whatever assistance we can to these more than deserving causes. Having been at the cutting edge, we can relate to the difficulties they face in garnering support and in our own small way we like to think that we are helping them fight the good fight. Please take the time to visit a special section at our site dedicated to this aspect of our work. Go to www.iasa-intl.com and hit the link on the left hand menu named Heavenly Brickks. From there you can see some of what we have done for these organizations and at the same time be able to link to them directly if you so desire.

We welcome your feedback on any aspect of this report and thank you for taking the time to read this far.