行政院及所屬各機關出國報告
（出國類別：研究）

參加國際航空安全調查員協會2003年會報告

服務機關：行政院飛航安全委員會
出國人職　稱：組　長、調查官、工程師
姓　　名：周光燦、李寶康、梁　群

出國地區：美國華盛頓特區
出國期間：民國九十二年八月廿三日至九月一日
報告日期：民國九十二年十月一日

112/C09203671

行政院及所屬各機關出國報告提要　　系統識別號 C09203671
出國報告名稱：參加國際航空安全調查員協會 2003 年會報告
頁數： 55 頁含附件：是

出國計畫主辦機關：行政院飛航安全委員會
聯絡人：黃佩蒂　　電　話：(02) 2547-5200 分機 154

出國人員姓名：周光燦、李寶康、梁　群
服務機關：行政院飛航安全委員會
單位：失事調查組
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出國類別：□1 考察□2 進修■3 研究□4 實習□5 其他

出國期間：民國九十二年八月廿三日至九月一日
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報告日期：民國九十二年十月一日

分類號/目

關鍵詞：年會、航空安全調查員、ISASI
內容摘要：(二百至三百字)

國際飛安調查員協會（International Society of Air Safety Investigators，ISASI）2003 年會(第卅四屆)定於本（九十二）年八月廿五日起在美國華府舉行五天，議程包括記錄資料訓練課程，美、法、澳、巴西等國失事調查及民航主管機關首長專題演講，以及來自世界各國專業人士發表之廿五篇論文。其中本會同仁將宣讀兩篇論文，一為航空器水上失事調查作業，另篇為三維軟體重建科技運用在航空器失事調查。本項會議係國際飛安調查人員年度內最重要之活動，除由各國資深專業人士發表論文外，會中並辦理訓練課程，提供與會人員最新調查科技與實務，此外亦為調查人員交換經驗與心得之良好機會。本會曾於去年辦理 ISASI2002，深獲國際人士之好評。

本文電子檔已上傳至出國報告資訊網

行政院及所屬各機關出國報告審核表

出國報告名稱: 參加國際航空安全調查員協會 2003 年會報告
出國計畫主辦機關名稱: 行政院飛航安全委員會

出國人姓名：周光燦、李寶康、梁　群
職　　稱：組　長、調查官、工程師
服務單位:行政院飛航安全委員會

出國計畫主辦機關審核意見:

□1.依限繳交出報告
□2.格式完整
□3.內容充實完備
□4.建議具參考價值
□5.送本機關參考或研辦
□6.送上級機關參考
□7.退回補正,原因:
　□(1)不符原核定出國計畫
　□(2)以外文撰寫或僅以所蒐集外文資料為內容
　□(3)內容空洞簡略
　□(4)未依行政院所屬各機關出國報告規格辦理
　□(5)未於資訊網登錄提要資料及傳送出國報告電子檔
□8.其他處理意見：

層轉機關審核意見:

□同意主辦機關審核意見
　□全部　□部份_____(填寫審核意見編號)
□退回補正,原因:_____(填寫審核意見編號)
□其他處理意見:

目　　次

壹、 目　　的

國際航空安全調查員協會(International Society of Air Safety Investigators - 簡稱 ISASI)係於一九六四年在美國創立，現已發展為一國際專業組織，會員包括：飛安及失事調查機關、民航主管機關、航空器、引擎及航電產品製造廠、航空公司及研究機構人員。該協會每年秋季舉行年會，由會員輪流主辦，每次年會參加人數近三百人，因該年會豐富專業內容，參加人士日益增加，本屆年會之代表人數將近三百五十人，係近年來參加人數最多者。

本屆年會議程（詳如附錄一）摘要如下：

一、 訓練課程：

包括記錄資料及火災調查等兩項，該項訓練安排在美國運輸安全委員會（National Transportation Safety Board, NTSB）新近落成之教育大樓實施。

二、 專題演講

包括美國之運輸安全委員會主席 Ellen G. Engleman 及聯邦航空總署署長 Marion C. Blakey 以及飛航管制員協會會長 John Carr、法國航空事故調查局局長 Paul-Louis Arslanian、澳大利亞運輸安全安全局安全調

查處處長 Robin Graham、巴西失事調查局局長 Marcus da Coasta 等六位貴賓。

三、 論文宣讀：

共有來自世界各國廿五位專業人士發表論文，包括本會失事調查組組長周光燦之【華航 CI611 班機失事調查進度】，調查官李寶康之【航空器水上失事調查作業】及工程師梁群之【三維軟體重建科技運用在航空器失事調查】。

貳、 過　　程

國際航空安全調查員協會本（卅四）屆年會於九十二年八月廿五日至廿九日在美國華盛頓特區之 Crystal Gateway Marriott 飯店會議中心舉行五天，詳細議程如下：

一、 訓練課程：時間：九十二年八月廿五日（週一）

本次課程先由美國運輸安全委員會（National Safety Transportation Board，NTSB）記錄器部門主任 James Cash 及工程師 Erin Gormley 講授，除介紹大家熟知的飛航記錄器外，亦包含航空器上其它的記錄單元以及地面上記錄設備如雷達等，不論記錄資料媒介為何，皆有其先天上的限制或處理時可能發生的問題，而在各項資料相互配合使用時，時間同步更是必須注意的重點。

之後，由聯邦航空總署專家講授航空事故之火災調查訓練（Fire Investigation）。教官使用 POWER POINT 及錄影帶顯示資料照片，輔助說明 NTSB 經歷與火災有關之事故調查，部份資料是耳熟能詳如 ValuJet 失事。

二、 技術研討會

✧ 八月廿六日（週二）上午

■ 專題演講 – 美國運輸安全委員會主席 Ellen G. Engleman（講稿詳如附錄二）

■ 論文

1. 利用 REASON 模型分析失事肇因（Root Cause Analysis, using REASON: A building block for accident / incident investigation）- AirTran 航空公司 Jean-Pierre Dagon
2. 由萊特兄弟到太空梭：回顧航空器失事調查（From the Wright Brothers to Space Shuttle: A Historical Perspective of Aircraft Accident Investigation）- 美國運輸安全委員會 Jeff Guzzetti / 美國國立航太博物館 Brian Nicklas
3. 緊急與不正常情況研究計畫（The Emergency and Abnormal Situations Project）- 美國航太總署 Ames 研究中心 Barbara Burian

✧ 八月廿六日（週二）下午

■ 專題演講 – 法國航空事故調查局局長 Paul-Louis Arslanian

■ 論文

4. 華航 CI611 班機失事調查進度（CI611 Accident Investigation Documentary）- 行政院飛航安全委員會失事調查組組長周光燦

5. 三維軟體重建科技運用在航空器失事調查

（Application of Three-Dimensional Software Reconstruction Technology in Aircraft Accident Investigation）- 行政院飛航安全委員會工程師梁群

6. 航空器水上失事調查作業（Wreckage Recovery Operation and Lessons Learned）- 行政院飛航安全委員會調查官李寶康

7. 航空器失事之生還因素調查（Investigating Survival Factors in Aircraft Accidents: Revisiting the Past to Look to the Future）- 航空公司運輸協會 Tom Farrier

8. 利用聲紋分析因爆炸造成之航空器結構失效解體（CVR/CAM System Discrimination of Explosions vs. Structural Failure Decompressions）- 英國南普頓大學 Stuart Dyne

✧ 八月廿七日（週三）上午

■ 專題演講 – 美國聯邦航空總署署長 Marion C. Blakey（講稿詳如附錄三）

■ 論文

8. 如何決定是否需要重建失事航空器（Aircraft Reconstruction – The Decision Process）- 前波音

飛機公司飛安部主管 John Purvis

9. 檢討空服員參與航空器失事調查（Historical Review of Flight Attendant Participation in Accident Investigation）- 美國空服員協會 Candace Kolander

10. 運用資訊科技強化調查作業（Investigation Enhancement through Information Technology）- 銀河科技公司 Jay Graser

11. 不需失事也能調查失事（Accident Investigation without the Accident）- Flightscape 公司 Mike Poole

✧ 八月廿七日（週三）下午

■ 專題演講 – 美國飛航管制員協會會長 John Carr（講稿詳如附錄四）

■ 論文

12. 一九O八年萊特與賽福瑞吉失事調查結論（Summary of 1908 Wright/Selfridge Mishap）- 美國軍事病理研究所所長 Adrienne Noe

13. 透過評估及設計進步以強化乘客之保護措施（Enhanced Occupant Protection through Evaluation and Advances in Design）- Embry-Riddle 航空大學 William D. Waldock

14. 航空器失事調查：太空及預防醫學扮演之角色（Aircraft Accident Investigation: The Role of Aerospace and Preventive Medicine） - 聯邦航醫學會 Allen Parmet

15. 透過受傷模式分析以強化乘客之保護措施（Enhanced Occupant Protection through Injury Pattern Analysis） - 美國空軍醫檢官 William T. Gormley

16. 乘客傷亡鑑識（Forensic Aspects of Occupant Protection: Identification of Casualties） - Marquette 大學運輸安全學院 Mary A. Cimrmancis

17. 國際民航組織近況報告（Update of ICAO Activities） - 國際民航組織失事調查處長 Caj Frostell

✧ 八月廿八日（週四）上午

■ 專題演講 – 澳大利亞運輸安全局長 Rob Graham

■ 論文

18. 可控飛航撞地/進場降落失事預防之挑戰（The CFIT/ALAR Challenge） - 飛安基金會 Jim Burin

19. 1978 至 2002 年美國航空公司停機坪相關失事/意外事件分析（An Analysis of Airport Ramp-related

Accidents/Incidents Involving US Air Carriers, 1978~2002）- 美國聯邦航空總署 Robert Matthews

20. 從失事調查到預防（From Investigation to Prevention） - 美國駕駛員協會 Mike Huhn / Linsdsey Fenwick
21. 駕駛艙影像記錄裝備（Joint CAA/AD Aerospace Presentation on Flight Deck Image Recording） - 英國

✧ 八月廿八日（週四）下午

■ 專題演講 – 巴西失事調查局局長 Marcus Da Costa

■ 論文

22. 航空公司安全資訊（Airline Safety Data）- 美國西南航空公司 Timothy J. Logan
23. 運用三維電腦斷層掃瞄技術調查失事（Three-Dimension Computed Tomography Scanning in Accident Investigation） -美國運輸安全委員會 Scott Warren
24. 2001年三月DHC-6型機失事調查技術(Investigating techniques used for DHC-6 Accident March 2001) - 法國航空失事調查局 Stephence Corcos / Gerald

Gaubert

25. 太空梭哥倫比亞號失事調查（Investigating the Space Shutle Columbia Accident）- 美國聯邦航空總署失事調查處長 Steve Wallace

✧ 八月廿九日（週五）

- 參觀美國運輸安全委員會訓練學校（NTSB Academy）
- 參觀國立航空及太空博物館(National Air & Space Museum）
- 參觀萊特兄弟紀念物（The Wright Flyer and other Wright Brothers Artifacts）

參、 心　　得

一、訓練課程

1. 記錄資料課程（Recorded Data Tutorial）

1.1 飛航記錄器

飛航記錄器係指座艙語音記錄器（Cockpit Voice Recorder，CVR）及飛航資料記錄器（Flight Data Recorder，FDR），CVR可記錄座艙中組員的對話及環境聲音，FDR可記錄航空器運作時各項重要的飛航參數，如高度、速度或姿態等，兩者裝置的主要目的，皆在協助航空器失事調查，預防類似事故的發生。

早在1940年航空界就已提出了FDR的概念，但由於技術無法配合，因此實際運用在民用航空器上的第一具FDR於1953年產生。FDR經過不斷的技術研革以及法規要求，目前市面上所使用的皆為數位式FDR，記錄媒介分為舊式的磁帶式以及新的固態式，國際上對於FDR相關的規範主要依據EUROCAE、ARINC以及Technical Standard Orders（TSO），目前所規定的記錄長度為25小時，依航空器狀況不同，所要求可記錄的參數由22至88個不等，另外對FDR所能承受的抗撞毀能力也有一定的要求。

在使用FDR的記錄資料時，需了解FDR的記錄邏輯，例如其由兩位元的原始資料如何轉換為可用的工程資料，各參數由於感測器（sensor）的工作限制而有的上下限及解析度為何，各參數實際的取樣頻率依對變化程度的不同可能由12Hz（如加速度G值）至1/16Hz（如日期）不等，了解其記錄模式的各種特性後，在運用其資料時才可避免產生誤差或不正確的理解。

CVR本身發展的歷史較晚，法規上對於CVR一直到了1960年左右才有所要求，目前的CVR仍有類比的磁帶式和數位的固態式兩種，要求的記錄時間已朝向由原本的30分鐘提高至兩個小時的趨勢，記錄來源一般可分為正駕駛員、副駕駛員、第三飛航組員或客艙廣播（Public Address，PA）以及座艙區域麥克風等四個頻道，由於CVR具有記錄個人聲音的敏感性，因此對於其錄音資料使用應有所保密，不僅錄音絕不可對外公布，除為調查必要，抄件中的其它內容亦不應公開。法規對於CVR的抗撞毀能力，與FDR的規定相同。

CVR錄音不僅是可以直接得到組員對話、與航管的通聯、與空服員的對話等訊息，另外對於所記錄的其它環境聲音，還可進一步做為航空器系統失效、結構破壞、滑行速度計算等的依據。

目前新的科技發展為將CVR和FDR結合為一個記錄器，這對兩者在時間同步及解讀記錄器上皆有所助益，另外對於座艙內裝置攝影機記錄影像的構想，也在技術突破以及法規修改的發展階段，相信不久飛航記錄器將有另一番不同的面貌。

1.2 其它記錄裝置

因為不同的使用用途和環境，事實上航空器中仍有許多其它的記錄媒介，只是由於不是專為失事調查而設計，因此在抗撞毀能力上不像飛航記錄器有特別的要求，當事故航空器沒有裝置飛航記錄器時，此類資料的取得對調查而言將有其一定的助益。以下對於航空器上可獲得的其它記錄裝置做一簡介。

- 磁碟機

  屬於非抗撞毀單元的記錄媒介，在某些應用上如筆記型電腦、快速擷取記錄器飛航資料擷取單元（Flight Data Acquisition Unit，FDAU）、飛航測試儀表板等皆有可能以硬碟機做為其記錄的媒介，因此應將其視為記錄資料的來源之一。

- PCMCIA卡

  屬於非抗撞毀單元的記錄媒介，其特點為體積小，一般用做為筆記型電腦或GPS接收器的資料儲存單元。

- 動力記錄器（Power Analyzer and Recorder System，PAR）

  屬於非抗撞毀單元的記錄媒介，在某些渦輪引擎的航空器如Cessna Caravan和Bell 206直升機中會使用PAR來記錄異常資料，一旦動力相關參數超過正常操作值時，該筆資料就會被記錄下來，所記錄的資料種類如下：

  - 高度Altitude
  - 空速Airspeed
  - 引擎資料Engine information (speeds, temps and loads)
  - 旋轉系統資料Rotor system information (speeds, loads)
  - 時間Time
  - 二位元訊號Binary signals
  - 氣溫OAT

- 全球定位系統GPS接收單元

  其抗撞毀能力亦未經過認可，通常取樣率為1Hz，可記錄航空器航向、速度、時間、位置以及其預先設定的航點等，其記憶體運作須靠電池維持，記憶體可分為固定式記憶體或非揮發性記憶體，GPS的操作介面可由筆記型電腦取代。

- 快速擷取記錄器（Quick Access Recorder，QAR）

  為目前業者用以做為飛航操作品質控管（Flight Operations Quality Assurance，FOQA）的資料來源，可以磁帶、軟碟、硬碟或Magneto Optical（MO）碟做為記錄媒介，通常該裝置於座艙附近，一般可記錄較FDR更多的參數，資料容量亦較大。現在更有如隨身碟大小的mini QAR，使FOQA的資料取得更為方便。

- 數位飛航資料擷取單元（Digital Flight Data Acquisition Unit，DFDAU）

  FDR資料就是來自DFDAU，在DFDAU中有一緩衝記憶體，待累積一定筆數的資料後再送至FDR，因此在DFDAU記憶體中通常存有最後幾筆飛航資料。

- 非揮發性記憶體（Non Volatile Memory，NVM ）

  NVM廣泛應用在航空器數位零組件中，一般民用航空器通常會有上百個NVM，當飛航記錄器無法取得時，NVM為重要資料來源，但NVM並非抗撞毀設計，且一旦需要解讀其資料時，需要廠商的協助。應用NVM儲存資料的裝置如飛行管理電腦（Flight Management Computer，FMC）、Full Authority Digital Engine Control（FADEC）或EEC、Engine

Indication and Crew Alerting System（EICAS）、燃油表、通訊資料匣等。

- 可攜式記錄器（portable recorders）

  乘客或目擊者所攜帶的錄影機、錄音機、照相機、手錶或甚至手寫文件等。

- 安全監視錄影帶

  航空站或候機室的監視錄影帶在失事調查時亦為重要證據之一，甚至距離失事地點很遠的地方所裝設的錄影機，都有可能拍攝到重要的鏡頭。

- 滑翔機記錄器（Glider Recorders）

  每4秒記錄一次，可記錄11小時，可記錄內容包括時間、日期、位置、高度等，該記錄器主要目的是記錄滑翔機特殊紀錄。

1.3 未來記錄方式

目前的記錄器發展已朝影像記錄前進，因為若能記錄影像，則有關人機介面的互動、座艙環境的變化（起煙）、非言語的溝通（手勢）、組員的互動等都將彌補過去記錄器的不足。而不久將來若CNS/ATM一旦成為通信的標準之一，記錄器的記錄模式必要有所因應，以期能將類似飛航通信報告系統

（Aircraft Communications Addressing and Reporting System，ACARS）所使用的資料型態記錄下來。

1.4 記錄資料處理困難處

資料處理的困難除了在開始的資料獲取外，資料的後處理更是另一個挑戰，在處理資料時需經過過濾、平滑化和時間比對等工作，由於資料取樣率通常會過低或過高，因此並不是所有資料都適合做為失事調查的證據，因此得到的資料都必須清楚了解其來源和限制，包括感測器的原理、記錄媒介的限制、記錄邏輯的設計等，這些都直接影響到資料的取樣率、精確度和解析度。

愈來愈多樣的資料來源，也是另外的一個挑戰，是否需要這些其它來源的補充資料，所得到的資料又是否能夠使用，該如何整合不同來源的資料而得到一致的比較基準，都是資料處理時要面對的問題。

一個多記錄資料應用最明顯的例子即發生在今年二月的哥倫比亞太空梭失事調查，該事故共有337捲錄影帶飄出，共找回63捲，唯處理後發現28捲帶子的影像無法使用；共找到137捲底片，其中21捲完好；有4捲錄音帶飄出，但皆未尋獲；6捲記錄儀表的磁帶，找到其中的一捲；有4個硬碟，找到其中兩個。

調查小組將所有的資料處理後整合在一起，以做為尋找失事原因的依據。

目前的科技進步，記錄資料的方式和媒介日新又新，調查人員在以傳統飛航記錄器的資料為基礎下，必須建立解讀不同記錄媒介的能力，了解不同的資料來源、解讀方法，再將各式各樣的記錄資料加以處理整合，得到對調查更有幫助的證據，這是調查人員應保持的彈性，也才能在未來應付愈來愈複雜的失事調查工作。

2. 航空事故之火災調查訓練（Fire Investigation）

教官敘述事故火災經過、調查過程及結果，並未提供書面教材，經過部份學生反應後講師告知所有上課內容之調查案件皆可在NTSB網站下載，主辦單位將不會另發紙本教材。

此次上課場地為NTSB新建於喬治華盛頓大學內之訓練學校，教室及設備皆為新建，但對本次訓練及教材之準備並無特別用心之處，唯提供之火災調查經過及試驗過程值得參考。

此次訓練對航空火災有概念之認識及資訊取來源有所俾益，將來有關航空火災調查相關資訊之查詢具有參考價值。

二、技術研討會

本屆年會之技術研討會分為六個場次（Session），每個場次禁邀請貴賓發表專題演講，六位貴賓分別來自美國、法國、澳大利亞、巴西等國，為該國之民航主管機關或飛航事故調查機關首長。各篇專題演講除簡介主管業務外，並對其國內飛安現況及其改善方案作摘要說明。由其演講中發現有一共同特色，即對其飛安現況坦誠以告，能夠勇於面對問題與挑戰，積極提出改善方案。

萊特兄弟於1903年首次駕駛自製之航空器升空，雖然僅留空十二秒鐘，飛行距離才一百二十呎。一百年來，航空之發展可說是一日千里。而未來之發展更是無限。當年萊特兄弟之成功因素，諸如：資訊分享、利用科學試驗支持假說、事事存疑、以及減少成本等，仍然適用於今日之飛航事故調查。

有史以來第一件航空器失事是在萊特兄弟首次飛行之後五年，不幸的是失事案件接二連三發生。但是，透過飛航事故調查後之改進措施，航空安全得以改善，調查作業亦日趨成熟。

飛航事故調查機關之公信力必須基於事實、科學與數據之有效利用，並且據以鑑定事故可能肇因，提出飛安改善建議。嚴謹之調查作業與嚴格自律之調查人員更為此一專業不可或缺之條件。本會成立甫滿五年，全體同仁戰戰兢兢，黽勉不懈，

雖已獲得國際同業之肯定，但應切忌自滿，而能時詩自我惕厲，不斷自我學習，尋求進步。

來自七個國家之講員於技術研討會中發表廿五篇論文，分別從：航空器飛航事故調查之歷史、調查技術與資訊、調查報告之檢討等方面提出其實務經驗及未來作法，與會人士藉以分享不同之專業知識與經驗，並能回饋未來之調查工作。茲將論文心得分類摘要如下：

1. 人為因素分析方法

在近期的失事調查中，人為因素分析所扮演的角色愈來愈重要，無論是失事調查機關、研究單位甚至航空公司都對此一議題格外重視。例如本次年會中 AirTran 航空公司的 Jean-Pierre Dagon 先生根據 REASON's 模型所發展的 Root Cause Analysis（RCA）；美國航太總署的 Barbara Burian 女士所主持的 Emergency and Abnormal Situations（EAS）計畫；法國 BEA 對 SHELL 模型的延伸，亦或是這幾年來在美國學術界依據 REASON's 模型所發展的人為因素分析及分類系統（Human Factor Analysis and Classification System，HFACS）。不論所使用的分析方法是奠基在已有的理論基礎上加以改良、精進或是自行研究發展出來的，其方法都已較過去

所熟知的 SHELL 或 REASON's 模型更為的有系統、有組織，並且都已實際套用在發生的案例中，而使用後的結果也顯示出其探究事故原因時都更加的具有完整性和邏輯性。

2. 航空器空中爆炸與快速解體的聲紋分析

英國南普頓大學 Stuart Dyne 博士此次發表的「聲紋分析因爆炸造成之航空器結構失效解體」論文與本會目前進行中的 CI611 事故調查直接相關。文中所提及之 CVR Explosion Analysis 方法，理論上可用以判斷航空器爆炸起始點或是結構斷裂點，但經過美國 NTSB 以及 Stuart Dyne 博士本人的建議，由於該方法並無法對錄音資料有效的量化，因此所得到結果並不十分可靠。本會已與 Stuart Dyne 博士直接接洽，也已獲得其熱心的提供相關資料，此對 CI611 的調查分析應有相當助益。

3. 調查資訊科技化

銀河科技公司 Jay Graser 在會中提出的「運用資訊科技強化調查作業」，點出了目前的失事調查作業必須結合已發展成熟的資訊科技，才能應付日愈複雜的調查環境，提升調查作業的效率；Flightscape 公司的 Mike Poole（前加拿大 TSB 資深工程師）所提利用航空公司平常的飛航資料分析，及早發現並預防可能的問題，取代事故發生後的失事調查；法國 BEA 的

Stephence Corcos 和 Gerald Gaubert 在事故中應用新的失事調查科技來彌補事實的資料不足；美國 FAA 的 Robert Matthews 利用資料庫的建立以及統計的方法，分析美國機場停機坪相關的失事與意外事件；美國 NTSB 的 Scott Warren 發表的三維電腦斷層掃瞄技術調查失事以不破壞元件的情形下透視元件內部的損壞情形等，在在顯示出新的科技在調查中的地位，以及資料庫如何將原本雜亂零散的資訊整合後展現其對失事預防的貢獻。

4. 座艙影像記錄

英國 AD Aerospace Ltd 的 Mike Horne 會同英國 CAA 的研究人員簡報了未來幾年在飛航記錄器中重要的改革技術-座艙影像記錄-目前的發展情形。

要發展座艙影像記錄最基本的問題就是，調查人員對於所記錄的內容需求為何？因應需求，技術人員才能發展適合的軟硬體，就其所展示的錄影，目前的技術大多已克服，但仍有小部份硬體上的調整，如某些情況下會無法錄到儀表板的影像，也許是光線的原因或是攝影機角度的問題。另一方面，因為影像的記錄如同座艙的語音記錄一般，對於飛航組員的隱私是一種威脅，因此在發展的同時，必須儘可能的避免侵犯個人穩私，

因此在其錄製的影像中駕駛員人頭的部份都已做挖空處理。

由於辦理國際會議之費用日益高漲，而已經高昂之註冊費亦難調昇，因此ISASI年會主辦單位為節省經費，今年未印製年會論文集(Proceedings)供與會人士參考，而是發給光碟乙片，但對未攜帶筆記型電腦者卻十分不便。另外，光碟中僅燒錄論文，部分論文甚至應付厥如，而各講員發表論文時所展示之影音簡報檔亦未包括。此係年會持續卅餘年來，首度發生技術研討會資料不齊情形。然而瑕不掩瑜，本屆年會仍可稱得上成功。

肆、 建　　議

（一）本會自成立以來即加入 ISASI，並積極參與會務與年會活動，除在去年爭取在台北市主辦年會外，同仁陸續在歷屆年會發表論文，將本會在重大飛航事故調查之經驗與國際同業分享，今年發表之論文【三維軟體重建科技運用在航空器失事調查】，更深獲與會人士之高度興趣，會後不斷有國際同業前來索取相關資料。建議本會同仁多在國際會議發表論文，除與同業分享專業知識與經驗，並可藉以提昇國家形象與知名度。

（二）ISASI 之會員除個人外，團體會員（Corporate member）如飛航事故調查機關、民航主管機關、航空公司、製造廠及其他專業組織如飛行員協會。目前國內除本會為 ISASI 之團體會員外，尚有華航、長榮及飛安基金會。建議交通部民用航空局及國籍航空公司亦能加入此一國際組織。

（三）國內已有相當多之 ISASI 會員，總會副會長 Ron Schleede 建議在台灣籌設分會（ISASI Chapter）以匯集力量，共同為飛安調查貢獻心力，總會亦願提供必要之協助。

（四）本會雖也已對人為因素的調查有所著墨，但尚未發展或是延用一套適合自己調查需要的分析系統，因此同仁可針對目前在失事調查領域中已有的人為因素分析方法做更深入的研究，為本會的人為因素調查建立更完善的能量。

（五）本會實驗室在科技的應用及研發上相較於國際的其它調查單位的表現已有一定水準，如本次的三維軟體殘骸重建的展示在各會員間獲得好評，但本會所建立的資料庫在資訊整合和統計上則未有發揮，對此方面本會應繼續加強。

（六）目前影像記錄在法規上和技術上都尚在發展階段，因為本會無法如同其它屬 ICAO 會員國家的調查單位，能夠直接的參與其工作小組，因此更應隨時注意其發展的進度，以及早建立影像記錄器的解讀能量。

伍、 附　　錄

附錄一 國際航空安全調查員協會 2003 年會議程

附錄二 運輸安全委員會主席 Ellen G. Engleman 專題演講稿

附錄三 聯邦航空總署署長 Marion C. Blakey 專題演講稿

附錄四 美國國家飛航管制員協會會長 John Carr 專題演講稿

附錄五 國際航空安全調查員協會 2003 年會論文光碟片

附錄一　國際航空安全調查員協會 2003 年會議程

ISASI 2003 SEMINAR

Schedule of Events

Tutorial Program

Monday - August 25th

09:00-16:00 Recorded Data Tutorial—NTSB Academy

09:00-16:00 Fire Investigation Tutorial—NTSB Academy

10:00-10:30 Refreshment Break

12:00-13:00 Lunch

14:30-14:45 Refreshment Break

18:00-19:30 **Welcome Reception—Arlington Salon 3**
(Dress Code: Business Casual)

Main Program

Tuesday - August 26th

07:30-16:30 Registration open—Arlington Foyer

09:00-09:30
Seminar Opening—Nora Marshall, Vikki Anderson, Tom McCarthy
Welcome speech—Frank Del Gandio, President ISASI

Session I—Chaired by Nora Marshall

09:30-10:00
Keynote Speaker—The Honorable **Ellen G. Engleman**, Chairman, NTSB

10:00-10:30
The Practical Use of Root Cause Analysis System (RCA) using REASON: A Building Block for Accident/Incident Investigations—**Jean-Pierre Dagon**, AirTran Airways

10:30-11:00 Refreshment Break

11:00-11:30
From the Wright Flyer to the Space Shuttle: A Historical Perspective of

Aircraft Accident Investigation—**Jeff Guzzetti**, NTSB, **Brian Nicklas**, NASM

11:30-12:00
The Emergency and Abnormal Situations Project—**Barbara Burian**, PhD, NASA Ames Research Center

12:00-12:15 Q & A

12:15-13:30 Lunch—Arlington Salon 3

Session II—Chaired by Ron Schleede

13:30-14:00
Keynote Speaker - Mr. Paul-Louis Arslanian, Head of BEA, France

14:00-14:30
Aircraft Reconstruction: The Decision Process-**John Purvis,** 2001 Lederer Award Winner

14:30-14:45

CI611 Accident Investigation Documentary- **KF Chou**, Taiwan Aviation Safety Council,

14:45-15:10
CI 611 & GE 791 Wreckage Recovery Operations Comparisons and Lessons Learned- **David Lee,** Taiwan Aviation Safety Council,

15:10-15:30 Refreshment Break

15:30-16:00
Application of 3D Software Wreckage Reconstruction Technology in Aircraft Accident Investigation- **Victor Liang,** Taiwan Aviation Safety Council

16:00-16:30
CVR Recordings of Explosions and Structural Failure Decompressions- **Stuart Dyne**, University of Southampton, United Kingdom

16:30-17:00 Q & A

17:30 Bus leaves hotel for Odyssey Cruise
18:00-22:00 Odyssey Cruise **"Fun Night"**
(Dress Code: Business Casual—No Jeans or Athletic Shoes)

Wednesday —August 27th

08:00-16:00 Registration open—Arlington Foyer

Session III—Chaired by Vikki Anderson

08:30-09:00

Keynote Speaker—The Honorable **Marion Blakey**, Administrator, FAA

09:00-09:30

Investigating Techniques used for DHC-6 Twin Otter Accident, March 2001—**Stephane Corcos & Gerald Gaubert,** BEA

09:30-10:00

Investigation Enhancement through Information Technology—**Jay Graser,** Galaxy Scientific

10:00-10:30 Refreshment Break

10:30-11:00

Historical Review of Flight Attendant Participation in Accident Investigations—**Candace Kolander**, AFA

11:00-11:30

Accident Investigation Without the Accident—**Mike Poole**, Flightscape

11:30-12:00 Q & A

12:00-13:00 Lunch—Salon 3

Session IV—Chaired by Keith Hagy

13:00-13:15

Keynote Speaker—Mr. John Carr, President, NATCA

13:15-13:30

Panel Introduction: Summary of 1908 Wright/Selfridge Mishap—**Adrianne Noe**, PhD, Director, National Museum of Health and Medicine/Armed Forces Institute of Pathology

13:30-14:00

Crashworthiness Investigation: Enhanced Occupant Protection through Crashworthiness Evaluation and Advances in Design—A View from the Wreckage—**William Waldock**, Professor, ERAU

14:00-14:30

Enhanced Occupant Protection through Injury Pattern Analysis—**William Gormley**, MD, PhD, Col, USAF MC CFS (Ret.), Office of the Medical Examiner, Commonwealth of Virginia

14:30-15:00

Forensic Aspects of Occupant Protection: Victim Identification—**Mary Cimrmancic**, DDS, TSI, Marquette University,

15:00-15:30 Refreshment Break

15:30-16:00

Aircraft Accident Investigation: The Role of Aerospace and Preventive Medicine- **Dr. Allen Parmet**, MD, MPH, FAsMA

16:00-16:15 Q & A

16:15-16:30 Update of ICAO Activities—**Caj Frostell,** ICAO

16:30-16:45 General Membership Meeting

16:45 Working Group, Committee, Society Meetings

Free Night

Thursday—August 28th

09:00-17:00 Registration open—Arlington Foyer

Session V—Chaired by Erin Gormley

08:30-08:45

Keynote Speaker—Mr. Rob Graham, Director Safety Investigations, Australian Transport Safety Board

08:45-09:15

The CFIT and ALAR Challenge—Attacking the Killers in Aviation—**Jim Burin**, Flight Safety Foundation

09:15-10:00

Flight Deck Image Recording on Commercial Aircraft—**Pippa Moore**, CAA UK & **Mike Horne,** AD Aerospace

10:00-10:30 Refreshment Break

10:30-11:00

An Analysis of the Relationship of Finding-Cause-Recommendation from Selected Recent NTSB Aircraft Accident Reports—**Mike Huhn**, ALPA

11:00-11:30

Ramp Accidents and Incidents Involving US Air Carriers—**Robert Matthews**, FAA

11:30-12:00 Q & A

12:00-13:30 Lunch—Salon 3

Session VI- Chaired by Tom McCarthy

13:30-13:45

Keynote Speaker—Col. Marcus da Costa, Head of Accident Investigation, Brazil

13:45-14:15

Airline Safety Data: Where Are We and Where Are We Going—**Timothy Logan**, Southwest Airlines

14:15-14:45

Use of Computed Tomography Imaging in Accident Investigation—**Scott Warren**, NTSB

14:45-15:15 Refreshment Break

15:15-15:45

Investigating Survival Factors in Aircraft Accidents: Revisiting the Past to Look to the Future—**Tom Farrier**, ATA

15:45-16:15

Investigating the Space Shuttle Columbia Accident—**Steve Wallace,** Director AAI, FAA

16:15-16:45 Q & A

16:45-17:00 ISASI 2004 Presentation—Larry Doherty

Technical Program Closes—Nora Marshall, Vikki Anderson, Tom McCarthy

19:00-20:00

Presidents Reception (Cocktails)—Arlington Foyer

20:00-22:00

Awards Banquet—Arlington Ballroom

(Dress Code: Cocktail Attire)

附錄二　運輸安全委員會主席 Ellen G. Engleman 專題演講稿

Remarks of Ellen G. Engleman
Chairman, National Transportation Safety Board
Before The
2003 Technical Seminar of the
International Society of Air Safety Investigators
Arlington, Virginia
August 26, 2003

It is a privilege to serve as the 10th chairman of the National Transportation Safety Board. I follow in the footsteps of dedicated and gifted professionals and enjoy the unique opportunity to work with an amazing team of fellow Board Members and staff. On behalf of Vice Chairman Rosenker, Members Goglia, Healing and Carmody, as well as the 429 family members of the NTSB team, it is an honor to talk with you this morning.

Thanks to Frank Del Gandio, Ron Schleede, Nora Marshall, and Vicky Anderson and the ISASI membership for inviting me to join you this morning.

Much is to be celebrated with the centennial year of flight. As we look back in amazement at the last 100 years, from a wobbly flight of 12 seconds that went 120 feet at a height of about 10 feet to the development of an international airline industry which had over 3 trillion miles of passenger flight in the year 2000. Human spirit and accomplishment are unlimited.

As the Wright Brothers worked toward their goal of human flight, they were meticulous in their experiments and adhered to the best scientific principles. As a result of analyzing their own glider experiments they began to question some of the commonly accepted scientific data. They approached each problem methodically, keeping meticulous notes on the variations and results of each test. They would allow no guesswork, no hunt and peck -- an approach to problem solving that was standard to the world of the 19th century.

The qualities that made the Wright Brothers a success are still enormously important in aviation today. International sharing of information, the use of scientific testing to support hypotheses, questioning commonly held beliefs and a desire to cut costs are all principles that we adhere to today when we conduct accident investigations.

The first official investigation of an aviation accident occurred five years after the Wright brother's historic flight and was due to the death of Lt. Thomas Selridge at Fort Meyer, Virginia in 1908. Unfortunately other accidents would follow and with each investigation changes were made to both improve aviation safety and the accident investigation process. The independent NTSB is one of the results of this.

We may not label the Wright Brothers and other early pioneers as accident investigators, but clearly their approach to aviation is no different than our modern approach to accident investigation. The early pioneers had many more mishaps and accidents to learn from than we do today, but all of their improvements were a result of meticulous investigation into the problems of flight and a willingness to question commonly-accepted theories and practices.

As you all know the NTSB does not have regulatory authority. Our power lies solely in our credibility. I have stated and will continue to say that the NTSB's credibility is based on our use of fact, science and data, NOT supposition, guess or desire -- in making our determinations of probable cause as well as issuing our safety recommendations. It is this strict discipline that gives the NTSB it's worldwide credibility for unbiased, fact based assessments and allows us to go forth and issue the significant safety recommendations that we send to industry, to the 50 states and to other federal agencies and the DOT, including the FAA.

Constant review of data from accidents and normal operations, a curiosity to explain what happened when something goes wrong and a willingness to question accepted theories and practices will yield new safety knowledge from fuel tank inerting and rudder re-design.

As we review the past and look to the next hundred years of flight, one constant remains the same, however, and must remain the same -- the issue of safety.

I do not believe that there is or can be a question of choice between safety OR security. In a post 9/11 world, we must find a way to accomplish both tasks without jeopardizing or negatively impacting the other. It must be safety AND security. There is a balance that will be achieved and must be achieved in order for peace and prosperity to continue. Let us remember that economic strength is one of the greatest weapons against terrorism. The direct impact of the airline industry on Gross Domestic Product in the US is $306 billion.

Internationally, the revenues of the top 150 airlines groups is estimated $300 billion and we haven't even included the impact of related industries such as the travel and hospitality industries. Therefore it is critical that all partners in this industry, manufacturers, management, maintenance, the pilots, the flight attendants, the airports – internationally and nationally, -- work together to get this industry back in the sky. Our ultimate mission is to ensure public confidence in the national and international transportation system.

As you know the role of the NTSB is unique -- I have had more than one person tell me that while they were delighted to meet me the first time, they hoped to never have to meet me again. I understand.

It's sometimes hard to determine how to frame one's words and thoughts when everything you say is based on the fact that an accident occurred and that lives were lost. But it is in tribute to them, that the work of the NTSB is focused -- that out of tragedy may come the promise of a safer future. May we learn in order to protect.

The NTSB is responsible, consistent with the US Department of State requirements, to fulfill the obligations of t he United Sates presented in Annex 13 to the Chicago Convention on International Civil Aviation.

This means that for an accident or incident in a foreign state involving civil aircraft of a US operator or of US registry, manufacture or design, while the state of occurrence is responsible for the investigation, the US Government participates in these investigations through an NTSB appointed accredited representative and a team of technical advisors named by the NTSB. The U.S. is also responsible to transmit information to maintain continued airworthiness and the safe operation of aircraft. Thus our role is to appropriately participate in foreign investigations and maintain the health of the US manufactured fleet.

As you know, the NTSB is a fiercely independent agency that must remain so in order to accomplish our mission of determining the probable cause irrespective of fault. Once that probable cause is determined we issue our recommendations -- we have issued over 12,000 with 80+ percent acceptance rate .... and while that is good on its face, when I came to this office in March we had 1,025 open recommendations.

Open recommendations mean that the safety loop is not closed..... open recommendations mean that our job is not done.... the risks that have been identified still remain -- and action is yet to be completed.

So a key aspect of my tenure at the board will be to clean up the record of outstanding recommendations -- and we are focused in each mode, with the states and with industry to accomplish this task. I fiercely believe that the NTSB's independence should not be interpreted as adversarial. We must be partners in achieving safety, our goals, our mission and our dedication to protecting lives must be on parallel if not overlapping paths. Here are areas of interest to us as we continue these endeavors:

Runway Incursions. We can't afford to wait for the perfect high tech solution and must find and implement low-tech alternatives or phased in approaches, focusing on the dozen or so of the airports with the highest risk. In the US, the runway status lighting system to be installed at Dallas Fort Worth and the use of 24-hour runway guard lights at Las Vegas will hopefully provide immediate improvements and support a multi-layered approach to safety. But as the tragedy in Taipei, Taiwan on October 31, 2000 and the accident in Milan Italy on October 8th, 2001 illustrated, the issue is not yet resolved.

Center Wing Fuel Tanks. The FAA must complete a rulemaking to prevent operators from flying transport category aircraft with explosive fuel-air mixtures in fuel tanks. The FAA is currently working with Boeing to test a fuel tank inerting system designed to prevent fuel tank explosions, they have not set a deadline to certify the system. Sooner is better than later. We cannot forget the tragedy, which occurred on March 3, 2001 in Bangkok, Thailand with the center fuel tank explosion that occurred at the gate.

Icing. Icing is a continued serious problem. A thorough certification test program, including application of revised standards to airplanes currently **certificated** for flight in icing conditions, is merited. The NTSB recommends that the FAA ensure manufactures of turbine engine aircraft clarify minimum safe operating speeds in both icing and non-icing conditions, and that carriers publish the information in pilot training and operating manuals.

Human Fatigue. Operating any vehicle or vessel without adequate rest, in any mode of transportation, is dangerous. The laws, rules and regulations governing this aspect of transportation safety are archaic. I hope that all modes will soon respond to this issue as illustrated the new hours of service rules recently completed by the Federal Motor Carrier Safety Administration.

As you know, recommendations that we have made to the FAA often affect the international community through standards and certification issues – and can also have results that return. Last year an NTSB team assisted our

colleagues in Germany with the investigations of a fatal midair collision between a Boeing 757 cargo flight and a Tupolev passenger airliner. Our investigations assisted the German authorities with examination of Operational Factors, Air Traffic Control, Traffic Collision Avoidance Systems and aircraft structures. This led to the Board's safety recommendation to the FAA to address potential safety issues in US systems and, I am glad to note that the FAA has recently responded positively to the recommendation and is working to make improvements in the US system.

We believe that safety is job one and will continue to work through the remaining open recommendations with each of the other DOT modes in this SWAT team approach to address all open NTSB recommendations and will continue to dog each and every one of them. Since March 24 we have closed 68 recommendations, and I want an upward slope on that graph.

Uniquely both FAA Administrator Blakey and I have both issued and received recommendations from the NTSB. We have the experience of shared moccasins and I truly believe that under her management and the leadership of Transportation Secretary Mineta that the open NTSB recommendations in all modes will be addressed. Of course, as you know the NTSB is not a regulator --we are a bully pulpit but I am holding daily services.

Performance and funding issues are also internal to the NTSB. We cannot make recommendations if we do not follow our own advice. As "CEO" of the Board, I am leading the staff in focusing on increased performance, fiscal management and quality of product delivery. The Safety Board must improve our ability to deliver an accident investigation report that is soundly developed based on science, data and facts and un-swayed by guesswork, supposition or desire. Our internal procedures are being reviewed to determine if there is a way to increase the timeliness of the reports. Yes, they must be thoroughly developed -- and cannot be hurried for false or artificial deadlines. That being said, I am focused on internal review of processes to see if we can increase our efficiency without affecting the quality. In a perfect world, no major accident report would take longer than 2 years, and general aviation and others would be finished in one year or less. Now that's a perfect world, but it is a goal as well.

And we're seeing results. Since March, the NTSB has conducted 112 accident investigations, including Air Algerie, Boeing 737 which crashed after take-off with 102 fatalities; Sudan Airways, Boeing 737 with 116 fatalities;

Kenya, Fairchild Metroliner with 14 fatalities and the NTSB continues to support the investigation of the China Air Boeing 747 which crashed in the straits of Formosa. We have fielded more than 1350 calls from the media or victim's families and our law judges have closed 131 cases and held 40 hearings. We have saved over $250,000 via procurement review and held 8 meetings and public hearings that included the most wanted list, 15 passenger vans, driver distraction, two rail accidents and Emery Worldwide Flight 17. We have also issued 47 new recommendations – so the beat goes on.

A new beginning will be the opening of the NTSB academy. This leased facility is located on the grounds of George Washington University in Ashburn, Virginia and offers new opportunities for safety partnership. It will house the NTSB investigation and safety training programs, offer opportunities for safety symposia, roundtable discussions and forums, formulate safety partnerships for research, development and implementation of new technologies and create a sanctuary for discussion of key safety issues and topics.

The National Transportation Safety Board relies on its partners in safety, and today is no different. We hope that the NTSB Academy will be the forum for international discussion on shared issues and interests. A place where shared knowledge and open debate will help grow the overall body of safety knowledge in industry, government, academia and in personnel. We are working on developing key issues that will be appropriate to this venue and I solicit your comments and support. With your help and the help of other industry and transportation leaders, this timely discussion can and will make a difference in achieving safer skies.

附錄三　聯邦航空總署署長 Marion C. Blakey 專題演講稿

Remarks Prepared for Delivery
Marion C. Blakey
Administrator
Federal Aviation Administration
International Society of Air Safety Investigators
Arlington, VA
August 26, 2003

Thank you, Vikki (Anderson) for that gracious introduction. And, thank you, Vikki and Frank (Del Gandio) for all your work putting together this conference.

Good morning. I bring greetings on behalf of President Bush, Secretary Mineta, and all of us at the Federal Aviation Administration (FAA). ISASI really is a remarkable forum that brings people together from all over the world. And, it's great to see so many people from so many countries. Aviation safety has no borders ... as demonstrated by the presence here today of so many senior officials from the investigation authorities representing four continents.

Thank you all for everything you do in taking on one of the toughest jobs in the world. Bill Adair, who wrote a book on the USAir Flight 427 crash investigation, admired air safety investigators before he started his work. But, after six years of up-close-and-personal, he says he is "constantly amazed at your ability to find the answer from little bits of metal."

And, for the first century of flight, accident investigation has been the bedrock of aviation safety. As our honored guest – founder of the Flight Safety Foundation – Jerry Lederer – has said, it was the challenge of safety in part that got the Wright Brothers interested in aviation. The 1895 death of German aviation pioneer – Otto Lilienthal – in a glider accident ... fired their desire to find the solution to safe flight.

One could call Wilbur and Orville Wright the first air safety investigators. On December 14th, three days *before* the breakthrough, Wilbur first tried to coax the *Flyer* into the air. He almost made it. But he was surprised by the sensitivity of the plane's elevator. He nosed up, stalled, and dived into the dunes.

The brothers identified the problem ... fixed it ... and flew into history three days later.

When Jerry Lederer issued his first safety bulletin at the U.S. Air Mail Service — telling pilots to crash land between trees so as to protect the fuselage — one in six U.S. airmail pilots perished on the job. Today, an

airline pilot in the United States faces a risk of a fatal accident about one in every 16 million flights.

And that, in large part, is because of what we have learned "kicking tin."

But today's aircraft are much more than thousands of parts flying in formation. They are highly complex pieces of machinery ... with hundreds of complicated systems. Add to this are the increasing numbers of aircraft ... as well as types of aircraft ... with different rates of speed and flight patterns ... from the smallest private aircraft to jumbo jets ... from helicopters to commercial space launches. And, of course, we all recognize the risks of the greater numbers of aircraft on our runways and taxiways.

And, as we all know from USAir 427, TWA 800, and AA 587 here in the U.S. and from accidents around the world ...accident investigations are increasingly driven by issues involving high-tech safety systems, integrated computer programs, high-grade materials and electronically generated data and data analysis.

I said this when I headed the Safety Board, and it's just as true from the vantage point of the Federal Aviation Administration: the cause of the next major accident is just as likely to be an error in a line of computer code as it is the failure of pilots to set their flaps during take-off.

We have gotten so good at solving — and preventing — the single cause accidents. It's the high-tech and system failures that we have to tackle now.

Look at what FAA's head of accident investigation – Steve Wallace – and the rest of the Columbia Accident Investigation Board faced with the Shuttle investigation ... plotting debris from California to East Texas, the equivalent of a debris field from Paris to Moscow ... foam that caused catastrophic damage ... extremely high temperatures of space travel ... and the pivotal role organization and culture can play in an accident.

As Admiral Hal Gehman says, "Complex systems fail in complex ways."

The shuttle investigation was truly a team effort ... investigator Dan Diggins ... from the FAA ... worked on characterizing NASA's decision making, complete with standards of risk and failure rates. FAA debris-reentry specialist Paul Wilde played a central role in foam impact testing. And, Don Day of our Southwest Region helped recover truckloads of shuttle debris. And, of course, NTSB with its store of expertise was tremendously helpful in figuring out where the debris landed.

And it's that team approach that enables aviation to enjoy such a strong safety record. But we can't ... and won't ... rest on our achievements. However good they are. All of us — government, operators, flight crews,

mechanics, and manufacturers — must be committed to an even stronger safety record. The public not only expects ... but they deserve ... the safest form of transportation.

Our goal at the DOT and FAA (smile) is to put accident investigators out of business. You and I know that this is a formidable challenge. But we want aviation to be so safe that investigators can spend more time teaching ... training ... maybe even spending some time not living out of a suitcase ... home with your families.

And to reach that point ... the aviation community is changing one of the biggest historical characteristics of aviation safety — our reactive nature. We must get in front of accidents ... anticipate them ...and use hard data to detect problems and disturbing trends.

And that is exactly what the FAA is committed to doing with a system safety approach. We identify hazards ... assess and analyze risks ... prioritize actions ... measure and document results. It's a continuous process that allows us to evaluate results as well as see where we need to take additional action.

CAST – or the Commercial Aviation Safety Team – is working well and is a perfect example of teamwork and getting in front of accidents. We're making real progress. CAST estimates we can reduce the risk of loss of control or CFIT accidents by more than 70 percent when we implement the agreed-upon safety enhancements.

Similar efforts are underway in Asia, Europe, and Central and South America. The Pan American Aviation Safety Team deserves special recognition for translating Flight Safety Foundation training materials into Spanish and Portugese. More than 12,000 pilots received approach and landing safety training.

That's the power of data disciplined analysis and follow through. This data-driven approach is why we're placing so much emphasis on information gathering and sharing. We need as much data as possible to make informed decisions, which is why FAA is working so hard to support FOQA and ASAP programs.

There are currently twelve major and regional U.S. airlines with FAA-approved Flight Operational Quality Assurance (FOQA) programs. By the end of this year, almost 1,800 airplanes will be equipped to collect and analyze FOQA data. This data provides objective information about daily line operations that's not available from any other source. And it's through this data that patterns and trends can emerge that allow us to identify a host of problems ...

including unstable approaches, exceeding operating limitations, aircraft subsystem malfunctions, and countless more.

Under Aviation Safety Action Programs (ASAP), the FAA provides enforcement-related incentives for employees who self-report possible violations through their local ASAP program office. To date, more than 80,000 ASAP reports have been submitted by airline pilots.

But while the information being collected through these programs is valuable, its full potential will not be realized as long as the data remains at the local operator level. To identify trends across airlines ... we must move forward with the aggregation of safety data on a national level. The FAA has already issued rules, which protect voluntarily submitted data and information from disclosure. And this had been a stumbling block. We've determined that FOQA data will be protected. We expect to issue a similar determination for ASAP data shortly.

Looking beyond our borders we need to make sure that this safety data is shared worldwide among safety professionals. And this is the entire point of the Global Aviation Information Network, or GAIN, initiative.

Aviation is the most international form of transportation ... and I strongly believe aviation safety is one of our nation's most important exports ... and it's one of our most important imports. We learn so much from our international partners. In fact, the FAA is taking action on recent recommendations from Canada, Germany, the U.K., and Taiwan on a broad range of issues ... from design and certification process to standardizing responses to TCAS resolution alerts.

And we're addressing safety on the airport surface. The FAA has commissioned 31 Airport Movement Area Safety Systems (AMASS) ... with 37 total installations planned for 34 airports. We know we have more to do. Improving runway safety depends on greater awareness by pilots, by controllers, and by airport vehicle drivers. This is why we're so focused on increased education, training and awareness as well as improved airport markings and lighting.

Training is so important. FAA has its own accident investigation school in Oklahoma City and we're in the process of standardizing training courses for international students.

I applaud ISASI for its international seminars. And I challenge you to build and grow and make these available to even more investigators. As the international society you are ideally positioned to take the lead ... to look at where aviation and technology is going ... and lead the development of more

training to ensure that your members — especially your airline members who may not have the same level of training available to them — are prepared with tools and training. This would be an enormous contribution to the profession of air safety investigator.

As you think about how you can become even more prepared, here's a role model for you ... Jerry Lederer ... a man who has spent three-quarters of a century finding the right solutions to make aviation safer. In 1948, he organized the Flight Safety Foundation's first accident investigation course. And I think it's fair to say that if there is one person who can be credited for aviation's outstanding safety record in the first century of flight, it is Jerry Lederer.

It is with great honor ... on behalf of the men and women of the FAA ... on behalf of millions of air travelers ... on behalf of everyone who takes a calculated risk to defy gravity and returns to earth safely ... that I present this special award to Jerry Lederer ... Mr. Aviation.

Congratulations, and thank you, Jerry.

附錄四　美國國家飛航管制員協會會長 John Carr 專題演講稿

REMARKS OF JOHN CARR
PRESIDENT
NATIONAL AIR TRAFFIC CONTROLLERS ASSOCIATION
BEFORE THE
INTERNATIONAL SOCIETY OF AIR SAFETY INVESTIGATORS
SEMINAR
CRYSTAL CITY GATEWAY MARRIOTT, ARLINGTON, VA

Good afternoon. My name is John Carr, and I am the president of the National Air Traffic Controllers Association. It is an honor and privilege to represent NATCA and speak before this very distinguished gathering of aviation safety professionals.

Founded in 1987, the National Air Traffic Controllers Association was chartered to ensure the safety and longevity of air traffic controller positions around the nation. Today, NATCA has grown to represent over 15,000 air traffic controllers throughout the U.S., Puerto Rico and Guam, along with 2,500 other bargaining unit members that include engineers, architects and other aviation safety professionals. NATCA is very proud to represent not only the interests of our membership, but the safety interests of the flying public, as well. Our motto, Safety Above All, is the litmus test against which all our decisions are based. We continually strive to improve and enhance aviation safety, and we proudly provide the safest air traffic control system in the world.

First and foremost NATCA is committed to promoting aviation safety and is committed to aircraft accident investigation through its own Air Safety Investigators Program. This program maintains a cadre of specially trained air traffic controllers that provide expert real time knowledge to aid in aircraft incident and accident investigation.

The interesting thing about aviation was best captured by Paul Theroux, who said: here is not much to say about most airplane journeys. Anything remarkable must be disastrous, so you define a good flight by negatives: you didn't get hijacked, you didn't crash, you didn't throw up, you weren't late, you weren't nauseated by the food.
As the aviation community celebrates the 100th anniversary of the Wright Brothers inaugural flight, it is interesting to note that the air traffic control community also celebrates an anniversary of almost 80 years of government

direction. Air traffic control has come a long way since Archie League stood at the end of a grass strip with two wands and a wheelbarrow, and airplanes navigated via radio beacons, radio ranges and bon fires. In December of 1935, the airlines established the first Airway Traffic Control Center in Newark, NJ; a second center was established in Chicago, and third center at Cleveland in June the following year. Finally, on July 6, 1936, the United States government assumed the operation of the three centers and established five more centers. The Civil Aeronautics Act of 1938 established new regulatory codes and air traffic rules, and the Civil Airways System was established with controlled airports, airway traffic control areas, and radio fixes as required reporting points.

Through out history, aviation accidents have changed the way air traffic controllers are required to do their jobs. For example, on June 30, 1956 a TWA Super Constellation and a United Airlines DC 7 collided over the Grand Canyon resulting in the loss of 128 lives. Although tragic, this accident highlighted the need for increased government regulation of air routes and modernization of the air traffic control system. In December of 1974, a TWA B727 crashed into high terrain on approach to Dulles Airport. This accident identified a lack of clarity in ATC procedures when flying on unpublished routes without clearly defined minimum altitudes and identified inadequacies in the depiction of altitude restrictions on the approach charts. Both accidents resulted in the federal government enacting changes in air traffic procedures.

Air traffic controllers serve in a unique, complex and safety critical occupation. They prevent collisions between aircraft, and at the same time, facilitate maximum efficiency in airspace and airport utilization by all classes of air traffic. An air traffic controllers' decision-making process requires quick thinking and the ability to be flexible yet uncompromising without reducing the margin of safety. This nation's air traffic controllers ensure the safety of over one million aviation passengers per day while working in stressful, high-energy environments where every controller knows there is no room for error. Perfection is the minimum acceptable performance standard.

The increased demand for air travel has brought the entire system to near capacity in recent years. We have all seen the pictures of endless rows of airplanes queued for runways. We have all experienced the delays on the taxiways or ramps. Much of the responsibility to meet this increasing demand

for air travel lies with air traffic service providers-the air traffic controllers. One challenge facing the aviation community is to continue to improve the air traffic system by increasing system capacity while not compromising or reducing the margin of safety. Your dedication to aviation safety has made air travel the transportation infrastructure of the 21st century. I flew to work today. I woke up in Tampa, ate breakfast with my family and got on a plane to speak to you folks. When I'm done, I'll get on a plane and be back in Tampa for dinner tonight.

Air traffic controllers are, by character, safety minded, and they see the consequences of an overloaded system daily. Aviation incidents and accidents often highlight critical issues in the air traffic control system. Safety records, dependability, convenience and cost aid in determining the state of the aviation industry including the air traffic control system.

In NATCA's opinion, the utmost concerns facing the United States air traffic control system include modernization of equipment, staffing shortages, aviation security, labor relations and most importantly, privatization. The most urgent issue facing air traffic controllers in the United States today is preventing the privatization of the air traffic workforce. In our view, air traffic control is an inherently governmental function, which directly and significantly affects the lives of everyone. Air traffic control is intrinsically linked with the public interest so much so as to mandate its performance by government employees. Over the next few weeks, this critically important subject will again be addressed in the U.S. Congress. NATCA has been working this month to build support for our stance on the issue of privatization and have asked lawmakers to stand behind their votes and support the safety of our air traffic control system. Simply put, privatization of our industry stands to put profits over safety and that is unacceptable.

How does that affect you, you might ask?
Well, I don't have to tell any of you in this room that it is essential that investigations of air traffic incidents remain independent of external influence and blame and focus on accident prevention. But when you deal with privatized air traffic control systems, there are problems that muddy the waters.

We have been watching Canada, and other privatized air traffic control

systems, and how they work with investigative bodies. In Canada, in spite of the wishes by the Canadian safety board, management officials rather than front line controllers participate in the investigative process. Of course, this makes absolutely no sense. In the U.S., our obvious fear is that the same scenario would hold true. In fact, there have been instances where controllers were denied party status to investigations of incidents involving contract towers.

Here something else to consider: While claiming to maintain oversight of the Contract Tower Program, the FAA cannot answer why tapes and records of midair collisions at FAA facilities are open to the public via the Freedom of Information Act, yet when a midair occurs at a contract tower, the tapes are hidden from FAA oversight and public view. Without the tapes, how do you conduct an investigation or work to prevent future incidents?

I'm sure you saw a copy of the major newspapers this morning with your coffee. On page 13 of The Washington Post today, the headline reads safety versus Profit? Contractors Had Potential Conflict? In the Wall Street Journal, the big story today says a push toward privatization that began in the mid-1990s led to an abdication of responsibility for overseeing safety. If we needed any evidence that profit runs contrary to safety, just look at the paper.

I would like to now take a few moments to discuss the tragic events of September 11, 2001, and the role of air traffic controllers all over this nation that morning. That fateful day may stand alone as truly the worst day in the 100 years since the Wright Brothers first flew. However, during this single event, one of the most horrendous acts in United States history, the nations' air traffic controllers, true champions, never lost their composure and maintained exceptional dedication while performing their jobs flawlessly.

When Transportation Secretary Norman Mineta issued the order to shutdown the National Airspace System at 9:45 that morning, air traffic controllers all over the United States landed over 700 airplanes within four minutes. Air traffic personnel directed every aircraft to land at the nearest airport immediately, effectively rerouting one aircraft every second. Over the next four hours, controllers safely guided another 4000 airplanes with no errors. This unprecedented challenge, an undertaking never before practiced, trained or imagined, tested the resolve of everyone. Their extraordinary actions most

likely prevented additional loss of life further demonstrating an outstanding achievement never before accomplished in the history of aviation.

As a result of the events that day, the complexity of the National Airspace System has increased significantly. During the initial weeks after the attack, controllers contended with almost daily changes in procedures and rapidly changing and often confusing airspace restrictions. Everyone worked intensely under incredibly dynamic and exhausting conditions during that time, and the commitment and professionalism displayed was a true example of the valued teamwork upon which the FAA and the flying public has come to depend. On that infamous day the spirit of air travel changed in a cataclysmic and abrupt way forever; however, the efficiency of the safest and most effective air traffic control system in the world was never compromised.

On that fateful day, these men and women of public service not only witnessed the tragedy of September 11, 2001, but also accomplished a feat never imagined with skill, determination and professionalism.

I'd like to say that safety is my business, and I'm here to tell you today that business is good. I represent thousands of professionals who put safety above all else and hold it as their sacred trust. The safety of our skies is not for sale, not to anyone, and we will continue to fight for safety above all else as we begin the exciting journey into the next 100 years of aviation history.

I'd like to leave you with a couple of closing thoughts:

Remember, you're always a student in an airplane.

Keep looking around; there's always something you've missed.

Try to keep the number of your landings equal to the number of your takeoffs.

You cannot propel yourself forward by patting yourself on the back.

There are old pilots, and there are bold pilots, but there are no old, bold pilots!

Things which do you no good in aviation: Altitude above you. Runway behind you. Fuel in the truck. Half a second ago. Approach plates in the care. The airspeed you don't have. Flying is the perfect vocation for a man who wants to feel like a boy, but not for one who still is.

And finally, gravity never loses! The best you can hope for is a draw!

Thank you for giving me the opportunity to speak this afternoon.

附錄五　國際航空安全調查員協會 2003 年會論文光碟片

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