行政院及所屬各機關出國報告
（出國類別：研究）

參加第六屆全球飛安資訊交流研討會報告

服務機關：行政院飛航安全委員會
出國人職稱：副工程師
姓名：張國治、劉震苑
出國地區：義大利羅馬
出國期間：民國九十二年六月十五日至六月廿一日
報告日期：民國九十二年十月一日

行政院及所屬各機關出國報告提要　　系統識別號 C09202321
出國報告名稱：參加第六屆全球飛安資訊交流研討會報告
頁數：53 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) 2547-5200ex.154

出國人員姓名：張國治、劉震苑
服務機關：行政院飛航安全委員會
單位：飛航安全組
職稱：副工程師　　電話：(02) 2547-5200

出國類別：□1 考察□2 進修■3 研究□4 實習□5 其他

出國期間：民國九十二年六月十五日至二十一日
出國地區：義大利羅馬

報告日期：民國九十二年十月一日

分類號/目

關鍵詞：GAIN、義大利、羅馬、全球飛安資訊交流研討會

內容摘要：(二百至三百字)

GAIN 是一個國際飛安社會成立的新組織，組成時間僅只七年，是一結合航空相關領域，包括：民航主管機關、航空業者、飛機製造廠、航空相關協會及組織等，藉由經驗的交流、分享，達成失事預防、提昇飛安品質等目標，GAIN 較其他組織不同之處為；其理念與發展皆以實務運作為主，亦即是由使用者(航空公司)看問題、討論問題繼而提出解決問題之方案與方法，故 GAIN 鼓勵各國之航空工業能投入其工作團體中，經由經驗及資源之共享，發展各項業務之準則；如分析方法與工具、航務及客艙安全手冊、資訊交流軟體系統等，最近該組織積極於政府支援團隊之強化，擬藉由政府之支持，讓更多的資訊尤其是潛在之問題能儘早浮上檯面，以便預防或解決，對於違法及處分等問題也能有進一步之溝通機會，期能找出一平衡點，朝向提昇飛安環境之目的努力。

本次出席會議的代表，來自世界各國包括美國、法國、英國、愛爾蘭、德國、法屬玻里尼西亞、瑞士、紐西蘭、荷蘭、澳洲、日本、韓國、加拿大、比利時、義大利、西班牙、葡萄牙、黎巴嫩、土耳其、巴基斯坦、沙烏地阿拉伯及台灣等

國之航空公司、飛機製造公司、飛機零件販售商、航空研究單位、政府民航主管機關及失事調查單位等，此外三兩天的的會議也都是由參與工作團體、政府支援團隊之航空公司或政府單位提出工作心得及成果，並透過分組討論，充分達到意見交流之目的，值得一提的是每個工作團體都是由各國之航空公司、飛機製造公司或航空社團組織組成，各團體皆有其組織及固定成員並依其所分配之任務，定期集會研討，所以目前工作團體A、B、C皆已有初步之成果，若此方案能持續推必能對飛安之提昇有所助益。

本文電子檔已上傳至出國報告資訊網

目　　次

壹、目的

Global Aviation Information Network (GAIN)的全名是「全球飛安資訊交流研討會」，其傳統舉辦方式是由美國及歐洲國家輪替主辦，而今年首次於亞洲地區舉行年會，GAIN 是由航空工業及政府民航主管機構共同推動的一種行動方案；藉由國際飛安社會的使用者，透過自發性的飛安資訊蒐集、分享及共同研發更積極有效之運作方案等方式，以提昇飛航環境品質，確保飛航安全。

雖然 GAIN 的最初構想是由美國聯邦航空總署(FAA)於 1996 年提出，但參與及投入此一方案之組織已涵蓋國際間各航空領域機關或單位；如航空公司、工會、航空製造業、航空相關產品販售業以及其他航空組織，目前 GAIN 已經歷五次國際會議之洗禮並積極的推廣其理念、與航空社會共享資源，以提昇飛航安全，共計約有來自 37 個國家，800 名飛安專業人員參與過全球飛安資訊交流研討會。

GAIN 成立之動機為：

1.雖然科技日益進步，但 20 年來相對比較航空器之失事率仍舊無較大之改善。

2.大部份的專家都同意制訂嚴苛的法律及處罰都將不是改善

飛安之重要因素。

3.資訊於現今是相當有價值的，它能使用在降低失事的風險，但是目前大部份的資訊不是未能蒐集齊全就是未能有效的被運用。

4.飛航資料監控及飛安事件報告系統之使用，或許能有機會將已流失之資料再截取回來。

5.目前正發展各式之分析工具，它們可使用這些資料進行飛安風險評估及幫助辨識失事及意外事件之徵兆。

6.高安全之網路系統能在最短的時間內進行飛安資訊之交換。

7.目前積極於消除法律及組織上之障礙，以期能蒐集及分享和完全應用飛安資訊。

8.解決及發展區域性之資訊分享能應用於全球。

GAIN 之組織結構為：

1. 指導委員會(Steering Committee)：

(1) 委員會成員包括：

a.航空公司(Airlines)

--JetBlue Airways (主席)

--Air France 法航 (副主席)

--British Airways 英航

--Delta Air Lines 達美

--Japan Airlines 日航

b.航空協會(Airline Associations)

--Air Transports Association 空中運輸協會

--International Air Transport Association 國際空中運輸協會

--Regional Airlines Association 區域性航空公司學會

c.飛機製造廠(Manufacturers)

--Airbus 空中巴士

--The Boeing Company 波音公司

d.工會團體(Employee Groups)

--Air Line Pilots Association 飛行員協會

--Int'l Association of Machinists & Aerospace Workers 國際機械師及太空工作者協會

--National Air Traffic Controllers Association 國家航管員協會

e.普通航空業 General Aviation

--Helicopter Association int'l 國際直昇機協會

--National Business Aviation Association 國家航空事業協會

f.軍方航空 Military Aviation

--US Navy 美國海軍

g.飛安基金會 Flight Safety Foundation

(2)指導委員會(Steering Committee)功能執掌：

制定 GAIN 的基本政策及行動計畫的發展，並運用工作團體(Working Groups)、政府支援團隊(Government Support Team)及企劃室等共同執行 GAIN 之理念。

2. 工作團體(Working Groups)

(1)功能執掌：

由各相關航空工業、政府團隊共同發展 GAIN，期能達到增進航空安全實務、飛安管理分析方法與工具及全球資訊交流系統開發等目的。

(2)工作團體(Working Groups)分為：

a.工作團體 A (Working Group A):航空運作安全實務(Aviation Operator Safety Practices)

b.工作團體 B (Working Group B):航空公司飛航安全分析方法與

工具(Analytical Methods and Tools for Airline Flight Safety Analysis)

c.工作團體 C (Working Group C):全球資訊交流系統(Global Information Sharing Systems)

3. 政府支援團隊(Governments Support Team)

成員由各國政府組織組成，藉由共同工作達到增進各國或區域之 GAIN 欲發展之理念。

4. GAIN 企劃室(GAIN Program Office)

設立 GAIN 企劃室之目的是在提供相關技術及行政支援予指導委員會(Steering Committee)、工作團體(Working Groups)及政府支援團隊(Governments Support Team)等，目前辦公室設於美國聯邦航空總署系統安全辦公室內(FAA Office of System Safety)。

貳、過程

由於會議於義大利羅馬舉行，旅行航程較遠，故大會設有會前會及歡迎會，以下為會議議程：

一、六月十七日(第一天)

註冊及歡迎會

二、六月十八日(第二天)

09:00 a.m. 註冊及報到

09:30 a.m. 會議開幕式

Ing. Fausto Cereti, Chairman Alitalia and Chairman Associazione Nazionale Vettori e Operatori del Transporto (Assaereo) / Italian Air Carrier Association

Ing. Benedetto Marasá, Director of Safety Regulation Area, Ente Nazionale per I'Aviazion Civile / Italian Civil Aviation Authority

10:00 a.m. GAIN 七歲生日—我們合作的成果？

Dr. Steve Predmore, Vice President of Safety, jetBlue Airways and Chair, GAIN Steering Committee

10:30 a.m. 休息

11:00 a.m. 航空公司飛安管理角色分析

Dr. Geoff Gosling, Aviation System Planning Consultant and Co-Chair of GAIN Working Group B
Mr. Jean-Jacques Speyer, Director Operational Evaluation, Human Factors and

Communications, Airbus Customer Services and Co-Chair of GAIN Working Group B

11:45 a.m. 航管安全分析之方法與工具

Mr. Ken Geisinger, Operations Research Analyst, Air Traffic Resource Management Program, Federal Aviation Administration

12:00 p.m. 飛安資訊分享系統

"How Information Sharing Contributes to Safety"
"Overview of Automated Airline Safety Information Sharing System"
"Experience Using a Near-Real Time Airline Safety Event Sharing System"

Mr. Tom Curran, Manager Air Safety, Aer Lingus and Co-Chair of GAIN Working Group C
Mr. Howard Posluns, Chief, Adnanced Technology, Transportation Development Centre, Transport Canada and Co-Chair of GAIN Working Group C

12:45 p.m. 午餐

13:45 p.m. 與其他工業分享 GAIN 的理念

Mr. Christopher Hart, Assistant Administrator for System Safety, Federal Administration

14:15 p.m. STEADES 產品

--國際航協飛安趨勢評估、分析及資訊交換系統

Mr. John Denman, Manager STEADES, International Air Transport Association

14:45 p.m. 飛航操作/航管操作安全資訊交換

"Engineering a Just Culture in Safety Data Reporting"

Mr. Peter Stastny, Head of Safety Regulation Unit, EURCONTROL and Co-Chair of GAIN Working Group E
"Pilot/Controller Collaboration Initiatives t Enhance Safety and Efficiency"
Capt. Alan Garin, Check Airman-A330,US Airways and Co-Chair of GAIN Working Group E

15:30 p.m. 休息

16:00 p.m. 分組討論 1 (計四主題)

17:00 p.m. 分組討論 2 (計四主題)

18:00 p.m. 波音歡迎酒會

二、六月十九日(第三天)

09:00 a.m. 簽到

09:30 a.m. GAIN 政府支援團隊之活動

Mr. John Vincent, Head, Strategic Safety and Analysis, UK Civil Aviation Authority

09:50 a.m. 飛安管理系統

"Various Approaches to SMS Identified by GAIN Government Support Team"
Ms. Judy Rutherford, Director, System Safety, Transport Canada Civil Aviation
"Implementation of SMS in Canada"
Mr. Don Sherritt, Director, Aircraft Maintenance and Manufacturing, Transport Canada Civil Aviation
"An Airline's Experience with SMS"

Capt. Michael Dilollo, Director-Flight Safety and Captain A330, Air Transat

10:30 a.m. 休息

10:45 a.m. 義大利使用飛安資訊之情形

"Activities of the Italian Flight Safety Committee"
Capt. Silvano Manera, President Italian Flight Safety Committee and Vice President Alitalia Group Flight Safety
"Activities at Ente Nazionale di Assistenza di Volo (ENAV) / Italian Air Traffic Services"
Avv. Massimo Varazzani, Chief Executive Officer, ENAV
"Activities at Agenzia Nazionale Sicureza Volo (ANSV) / Italian Air Safety Authority"
Prof. Bruno Franchi, President, ANSV

11:45 a.m. 更新歐洲協調中心於航空意外報告系統及民航事件報告資訊

Mr. Jean-Pol Henrotte, Air Safety Unit, Directorate for Air Transport, Directorate-General Energy and Transport, European Commission

12:15 p.m. 午餐

13:15p.m. 航空失事事件於犯罪之處理策略

A panel discussion moderated by Mr. Robert T. Francis II, Executive Vice President, Farrugut International
-Capt. Stu Julian, New Zealand Air Line Pilots Association, former Chief Accident Investigator
-Mr. Claude Guibert, Judicial Expert for French Courts, former exper8imental test pilot and

airline captain
-Prof. Ernesto Stajano, Magistrate, Italy

14:15 p.m. 分組討論 3 (計四主題)

15:15 p.m. 休息

15:30 p.m. 分組討論 4 (計四主題)

16:30 p.m. 分組討論 5 (計四主題)

17:30 p.m. 閉幕

18:00 p.m. 散會

參、心得

一、GAIN 的大事紀

- 一百年前 1903 年 12 月 17 日：第一架動力飛機升空
- 1996 年 5 月：美國航空總署 FAA 提出 GAIN 理念
- 1996 年 10 月：美國航空總署 FAA 舉辦第一屆 GAIN 會議(於美國波士頓)
- 1997 年 5 月：第二屆 GAIN 會議(於英國倫敦)由英國民航局及美國航空總署 FAA 聯合主辦
- 1997 年 8 月：GAIN 指導委員會舉行第一次會議，由業界擔任召集人
- 1998 年 11 月：第三屆 GAIN 會議(於美國長堤)由美國聯合航空公司主辦
- 2000 年 6 月：第四屆 GAIN 會議(於法國巴黎)由法國航空公司及空中巴士飛機製造廠聯合主辦
  -發展出航空公司飛航安全手冊(此為 GAIN 第一件主要產品)
- 2001 年 2 月：IATA 國際航協組織加入 GAIN 指導委員會

- 2001 年 12 月：第五屆 GAIN 會議(於美國邁阿密)
  由美國達美Delta及法國空中巴士飛機製造廠聯合主辦
- 2002 年 11 月：第一屆 GAIN 區域性會議(於日本東京)

二、GAIN 的參與人數

- 第一屆 GAIN 會議 (1996 年 10 月)
  -計有 166 人與會
  -計有 8 個國家參與
- 至 2003 年 5 月
  -累計 900 人與會
  -累計 49 個國家參與

三、GAIN 的定義

GAIN 提升、促進並透過國際航空社區使用者進行飛安資訊之蒐集及分享達到增進飛安之目的

四、GAIN 的範圍

1.提供資訊及程序以幫助於飛安決心下達者，包括：

-識別、鼓勵及支持現存之工具與程序

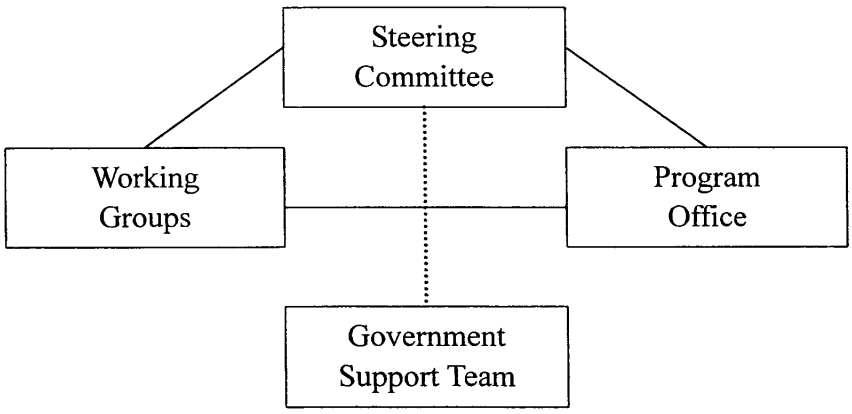
-促進新工具及程序之發展

2.由不同的資源中收集飛安管理程序資訊以及將其散佈至全球航空社區中

3.集合不同的團體以及促進協調、合作致力於飛安議題上

4.培育一收集及分享飛安資訊的環境

五、GAIN 的組織



六、GAIN 的指導委員會

- 航空公司

  -JetBlue Airways (Chair)

  -加拿大航空 Air Canada

  -阿拉斯加航空 Alaska Airlines

  -義大利航空 Alitalia

  -美國航空 American Airlines

  -日本航空 Japan Airlines

  -中東航空 Middle East Airlines

- 航空協會

  -空中交通協會 Air Transport Assoc.

  -國際空中交通協會 International Air Transport Assoc.

  -區域航空公司協會 Regional Airlines Assoc.

- 飛機製造公司

  -空中巴士 Airbus

  -波音公司 The Boeing Company

- 工會團體

  -飛行員協會 Air Line Pilots Assoc. (Vice Chair)

-International Assoc. of Machinists & Aerospace Workers

-國家管制員協會 National Air Traffic Controllers Assoc.

- 普通航空

  -國際直昇機協會 Helicopter Assoc. Int'l

  -國家商業航空協會 National Business Aviation Assoc.

- 軍用航空

  -美國海軍 US Navy

  -美國空軍 US Air Force

- 飛安基金會

七、GAIN 的產品及報告

- 第一件(1996 年 10 月)：第一個工作團隊誕生
- 第二件(1997 年 5 月)：四個工作團隊進度報告
- 第三件(1998 年 11 月)：資訊分享觀念的印證
- 第四件(2000 年 6 月)：提出飛航安全操作手冊、工具資訊及多項程序雛型等

- 第五件(2001 年 12 月)：7 份報告
- 第六件(2003 年 6 月)：8 份報告

八、GAIN 會議之目的

- 藉由工具及程序之示範，也就是經由飛安資訊之收集、分享及分析以促進飛航安全
- 尋求合法之策略進行全世界飛安資訊之收集與分享
- 於一個不明確的經濟環境中分享分方案以增進飛安管理之能力
- 經由網路建立一個擴及航空社區的關係
- 評估 GAIN 阻礙航空社區需求的通路
- 鼓勵更多的人參與 GAIN

九、GAIN 未來之發展期待

- 有更好的經濟動力參加工作團隊活動
- 增進飛安資訊之保護
- 擴大參與飛安資訊分享的夥伴
- 新 GAIN 領域，新的工作團隊？

十、工作團隊 B—航空公司在飛安管理的角色分析

(一) B 工作團隊目的：

運用現存之分析方法及工具，並同時發展新的方法及工具。

(二) B 工作團隊動機：

1.航空工業對飛航安全管理共同之理念

2.航空公司發展更寬廣之能力

--飛航資料監控

--駕艙監控

--保密性人為因素報告

--飛安資訊交換活動

3.方法與工具之需求增加

--管理與分析龐大之飛安資料

--由飛安資料庫中截取精華

--飛安資訊蒐集關於法規要求

(三)工作團隊 B 重點工作：(2002-2003)

1.由航空使用者社會中收集所需的分析方法與工具。

2.辨識及增進對現存方法與工具之認知。

3.發展現存工具以及評估它們對航空社會之使用性。

4.促進分析工具及服務於航空社會中。

(四) 工作團隊 B 2003 年成果：

1. 航空公司在飛安管理的角色分析

2. 出版第二版之航空公司飛分析方法與工具指南

-分析工具之應用與選擇

3.予航空公司之合作夥伴展示資料與範本工具

4.指導飛安之方法與工具應用於空中交通管理上

(五) 航空公司在飛安管理的角色分析

- 提供一完整之個別工具說明在指導航空公司飛安分析之工具與方法
- 工作團隊 B 之活動摘要與發現

-分析過程與需求調查

-航空公司飛安管理案例研討

-分析工具層級之定義

-分析工具進步之需求

-確認資源以支持飛安人員訓練

(六) 工作團隊 B 2003-2004 年計畫

● 更進一步要求飛安管理之分析方法與工具

-調查飛安部門人員以及其表現

-請求業界做資訊之回饋

-研究航空公司完整之飛安資料庫及核心標準分析

● 擴大現存及未來之方法與工具並運用於飛安分析上

-發展額外案例

-持續提供資訊於 GAIN 網站上

十一、飛安分析之方法與工具於空中交通管理

(一) 空中交通管理安全：

● 減低或消除航空器、人或財產的危險，其導致原因可能是航管系統的一個疏失或錯誤

● ATM 系統包括：

-航管

-飛航服務

-空域設計

-規定與程序

-ATM 要求

-機場運作

(二)方法與工具之型態：

- 空中交通安全事件資料系統
- 空中交通再次演練及無互動之模擬
- 人類互動模擬工具及設備
- 風險分析
- 人為因素分析
- 資料之版本及形象化
- 資料分析之一般工具

(三)結論：

- 沒有完美的工具

  -所有的工具都有其限制

  -每有一件工具可以解決所有的問題

  -任何工具都應智慧的使用

- 最好或綜合的工具是由解決問題而定
- 新工具正在研發

十二、資訊交分享於飛安上之貢獻

(一)工作團隊C之目的：

以系統宣導、促進、發展及實行等支持全球航空

安全資訊交換。

(二)工作團隊 C 之動機：

透過飛安事件之分享，航空公司能：

- 學習到一些事但不需經驗 (一個新機場、一個新機種、一個新問題)。
- 學習用不同之分法修正行動。
- 能夠蒐集到許多飛安事件超過一家航空公司所經歷過的。

(三)工作團隊 C 重點工作：(2002-2003)

1.促進系統發展在透過信任團體於最接近真實時間內達到航空公司飛安事件資訊交換。

2.宣導航空工業分享系統。

3.宣導系統的發展於安全課題之分享及改正行動。

十二、工作團隊 E

(一)工作團隊 E 之目的：

促進飛航作及航管操作間飛安資訊交換之合作。

(二)工作團隊E之重點工作：

1.促進保密性、非懲罰性介於飛航及管制操作社會

之安全交換報告。

2.宣導及促進飛航及管制操作之溝通及安全資訊之交換。

3.建立或提昇飛航及管制操作飛安資訊之蒐集及交換方案。

4.透過國際飛航及航管操作社會增進飛安資訊之蒐集及分享。

十三、GAIN政府支持團隊(GST)

(一)政府支持團隊之目的

支持、鼓勵GAIN之目標以及降低資訊分享之阻力。

(二)政府支持團隊之哲理

1.政府應該鼓勵自願致力於飛安資訊之蒐集及分享。

2.政府應該確保其法律規則以及政策是不會阻

斷飛安資訊蒐集及分享等活動。

3. 政府支持團隊應該鼓勵及持續參與 GAIN，並將範圍擴及世界各國政府組織。

(三)政府支持團隊目前成員

1. Group 1

法國：民航局(DGAC)、失事調查局(BEA)

義大利：ENAC

英國：民航局(CAA)、AAIB

歐洲代表團體：JAA、Nordic Working Group

2. Group 2

澳洲：CASA、ATSB

加拿大：TC、TSB

日本：JCAB

紐西蘭：CAA、TAIC

美國：FAA、NTSB

國際民航組織

(四)政府支持團隊工作重點

1.宣導並促進全球航空社會自願(非懲罰性)蒐集及分享飛安資訊。

2.協助減低合法性及組織上之藩籬，以免飛安資訊之蒐集及分享受到阻擾。

3.鼓勵政府組織支持 GAIN 之發展與執行。

肆、建議

GAIN 是一個國際飛安社會成立的新組織，組成時間僅只七年，是一結合各航空相關領域，藉由經驗的交流、分享，以達成失事預防、提昇飛安品質等目標。

GAIN 主要之任務焦點較著重於航空公司航務、飛安等方面之發展，今年也放入航管之議題，尤其是與駕駛員間之互動關係也甚為重視，至於機務領域之課題應是未來擬探討之方向。

GAIN 較其他組織不同之處為；其理念與發展皆以實務運作為主，亦即是由使用者(航空公司)看問題、討論問題繼而解決問題，故 GAIN 鼓勵各國之航空工業皆能投入其工作團體中，經由經驗及資源之交流、共享，發展各項業務之準則；如飛安資訊之分析方法與工具、航務及客艙安全手冊、資訊交流軟體系統等，最近又加入政府支援團隊，藉由政府之支持，讓更多的資訊尤其是潛在之問題能儘早浮上檯面，以便預防或解決，對於違法及處分等問題也能有進一步之溝通機會，期能共同找出一平衡點，朝向提昇飛安

之目的努力。

本次會議於義大利羅馬舉行，歐洲航空業界出席會議相當的踴躍，大會也期望能藉此機會更增進彼此之了解，而來自世界各國代表包括美國、法國、英國、愛爾蘭、德國、法屬玻里尼西亞、瑞士、紐西蘭、荷蘭、澳洲、日本、韓國、加拿大、比利時、義大利、西班牙、葡萄牙、黎巴嫩、土耳其、巴基斯坦、沙烏地阿拉伯及台灣等國之航空公司、飛機製造公司、飛機零件販售商、航空研究單位、政府民航主管機關及失事調查單位等，值得一提的是，此次會議亞洲地區航空界參與的相當踴躍，尤其以韓國、日本等，皆派出多名代表與會，顯現出其積極參與航空事務及拓展航空事業之決心，這樣的活動可以藉由彼此之互動、知識及經驗的交換，達到經驗交流之目的，同時也可瞭解其它國家之工作重點及長處可供參考。

此外兩天的的會議也都是由參與工作團體、政府支援團隊之航空公司或政府單位提出工作心得及成果，並透過分組討論，充分達到意見交流之目的，值得一提的是每個工作團體都是由各國之航空公司、飛

機製造公司或航空社團組織組成，各團體皆有其組織及固定成員並依其所分配之任務，定期集會研討，所以目前工作團體A、B、C皆已有初步之成果，若此方案能持續推必能對飛安之提昇有所助益，但我國航空界今年唯有華航派員參與，只能參與其中一工作團體之運作，甚是可惜，建議我國籍航空公司(不僅國際航線之航空公司)能多參與這類的國際聚會或工作團體，相信對我國航空事業的發展應有正面之影響。

特別的是，工作團體加入了政府支援團隊，也就因為各國民航主管機關及失事調查單位的參與、支持，讓飛安資訊的流通更為順暢，同時也正視法規對自願通報、資訊交流上之障礙，繼而研討解決之道，目前參與GAIN政府支援團隊(Government Support Team)之國家有:澳洲、加拿大、法國、日本、紐西蘭、英國、美國等，且這些國家皆是由民航主管單位及失事調查單位共同參與，此次會議我民航局亦派員與會，顯見GAIN會議在民航界之影響有正面且上升之趨勢，而亞太地區不論是航空業者或是民航相關單位也日益重視資訊交換、分享等活動，當然更期許我國

相關業者或政府單位不僅只是關心或出席會議，更應積極、主動加入各項活動、工作團隊，並以本身開始推展再與國際接軌，相信只要持續不斷的努力，在不遠的將來必能有所成就。

伍、附錄

SAFETY MANAGEMENT SYSTEMS

Transport

Canada

Transports

Canada

Aviation Safety Management

Introducing a Systems Approach to Safety Management

How to:

- Involve all staff in safety
- Develop a positive safety culture
- Maintain commitment
- Assess progress

Foreword

Aviation in Canada is growing and the Canadian public is confident that the aviation industry in Canada is safe. We are, however, facing serious challenges. For example, projected growth in aviation means that maintaining the current low accident rate will result in an unacceptable number of accidents. The challenge for Transport Canada and the industry is to find ways to lower the accident rate even further as the industry grows.

Flight 2005: A Civil Aviation Safety Framework for Canada identifies six Evolving Directions which represent the principal adjustments that we need to

make over the next few years:

_ Adopting a data-driven approach to enhancing aviation safety. This includes collecting and making more accessible the type of data that will support a proactive approach to safety;

_ Using a risk-based approach to resource allocation to support those activities which will achieve the greatest safety benefit;

_ Fostering and strengthening partnerships to put into effect the concept that responsibility for safety is shared by the regulator and the aviation community;

_ Implementing safety management systems in aviation organizations;

_ Taking account of human and organizational factors in safety management practices; and

_ Communicating effectively with the aviation community on safety.

Implementing safety management systems is the cornerstone of the evolving directions. All the other directions will evolve within a safety management system environment. Safety management systems are based on the fact that there will always be hazards and risks, so proactive management is needed to identify and control these threats to safety before they lead to mishaps.

The material in this booklet is condensed from a number of sources to introduce safety management system principles and concepts. Applying this approach will require changes in the way both Transport Canada and the industry deal with safety, including regulatory changes. This booklet is not intended to be a guide to compliance with the Canadian Aviation Regulations (CARs), but we hope it will be useful to owners and managers who want to engage their entire staff in safety.

Art LaFlamme

Director General

Civil Aviation

April 2001

Acknowledgements

This introductory booklet was written by the staff of the Safety Services Branch of Transport Canada Civil Aviation with help from the Headquarters and Regional staff of Transport Canada Civil Aviation. The material has been condensed from a variety of sources.

Transport Canada wishes, particularly, to thank Professor James Reason of the University of Manchester for inspiring and assisting Transport Canada in developing the concept and application of a safety management systems approach for the Canadian aviation industry.

Transport Canada thanks the Civil Aviation Safety Authority of Australia (CASA) for allowing us to use material developed by CASA for the Australian context. Parts of this booklet are adaptations of CASA's *Aviation Safety Management: An Operators Guide to Building a Safety Program.*

Granting this permission saved Transport Canada significant time and resources in the development of this publication.

Table of Contents

About Safety Management Systems

Why safety management systems?

In recent years a great deal of effort has been devoted to understanding how accidents happen in aviation and other industries. It is now generally accepted that most accidents result from human error. It would be easy to conclude that these human errors indicate carelessness or incompetence on the job but that would not be accurate. Investigators are finding that the human is only the last link in a chain that leads to an accident. We will not prevent accidents by changing people; we will only prevent accidents when we address the underlying causal factors.

In the 1990's the term 'organizational accident' was coined because most of the links in an accident chain are under the control of the organization. Since the greatest threats to aviation safety originate in organizational issues,

making the system even safer will require action by the organization.

After conducting extensive research and consulting world leaders in safety, Transport Canada Civil Aviation has concluded that the most efficient way to make the Canadian aviation system even safer will be to adopt a systems approach to safety management. Transport Canada is supporting the adoption of safety management systems by undertaking:

_ extensive discussion and consultation with all segments of the aviation industry;

_ a comprehensive educational and promotional campaign; and

_ changes to the Canadian Aviation Regulations (CARs).

What is a safety management system?

A safety management system is a businesslike approach to safety. It is a systematic, explicit and comprehensive process for managing safety risks. As with all management systems, a safety management system provides for goal setting, planning, and measuring performance. A safety management system is woven into the fabric of an organization. It becomes part of the culture, the way people do their jobs.

The **4 Ps** of safety management

Philosophy - Safety management starts with Management Philosophy:

_ recognizing that there will always be threats to safety;

_ setting the organization's standards; and

_ confirming that safety is everyone's responsibility.

Policy - Specifying how safety will be achieved:

_ clear statements of responsibility, authority, and accountability;

_ development of organizational processes and structures to incorporate safety goals into every aspect of the operation; and

_ development of the skills and knowledge necessary to do the job.

Procedures - What management wants people to do to execute the policy:

_ clear direction to all staff;

_ means for planning, organizing, and controlling; and

_ means for monitoring and assessing safety status and processes.

Practices - What really happens on the job:

_ following well designed, effective procedures;
_ avoiding the shortcuts that can detract from safety; and
_ taking appropriate action when a safety concern is identified.

The organizational structures and activities that make up a safety management system are found throughout an organization. Every employee contributes to the safety health of the organization. In larger organizations, safety management activity will be more visible in some departments than in others, but the system must be integrated into "the way things are done" throughout the establishment. This will be achieved by the implementation and continuing support of a coherent safety policy which leads to well designed procedures.

What does it take to build a safety management system?

Management initiatives are not always successful and each time a new idea is introduced people ask whether this is a worthwhile initiative, or a fad that will pass soon enough. Having a good idea does not guarantee success. Many good ideas have failed in practice because one or more of the three critical elements was missing: commitment, cognizance, and competence. These three "C's" of leadership will determine, in large part, whether safety management achieves its goals and leads to a pervasive safety culture in an organization:

_ **Commitment:** In the face of operational and commercial pressures do company leaders have the will to make safety management tools work effectively?

_ **Cognizance:** Do the leaders understand the nature and principles of managing for safety?

_ **Competence:** Are safety management policy and procedures appropriate, understood, and properly applied at all levels in the organization?

What is a safety culture?

An organization's culture is defined by what the people do. The decisions people make tell us something about the values of the organization. For instance, the extent to which managers and employees act on commitments to safety tell us more than words about what values motivate their actions.

A good gauge of safety culture is "How we do things around here." A safety

culture may be slow to mature, but, with management support, it can be accomplished.

A safety culture is:

_ An informed culture

• people understand the hazards and risks involved in their own operation

• staff work continuously to identify and overcome threats to safety

_ A just culture

• errors must be understood but willful violations cannot be tolerated

• the workforce knows and agrees on what is acceptable and unacceptable

_ A reporting culture

• people are encouraged to voice safety concerns

• when safety concerns are reported they are analyzed and appropriate action is taken

_ A learning culture

• people are encouraged to develop and apply their own skills and knowledge to enhance organizational safety

• staff are updated on safety issues by management

• safety reports are fed back to staff so that everyone learns the lessons

How do you encourage a positive safety culture?

_ management practices what it preaches regarding safety;

_ management allocates adequate resources to maintain an operation that is efficient and safe;

_ management acknowledges safety concerns and suggestions:

• management gives feedback on decisions, even if the decision is to do nothing;

• if no action is contemplated, that decision is explained; and
• feedback is timely, relevant and clear.

What does a safety management system do for an organization?

There are two ways of thinking about safety. Traditionally, safety has been about avoiding costs. Many organizations have been bankrupted by the cost of a major accident. This makes a strong case for safety, but cost of occurrences is only part of the story. Research shows that safety and efficiency are positively linked. Safety pays off in reduced losses and enhanced productivity. Safety is good for business.

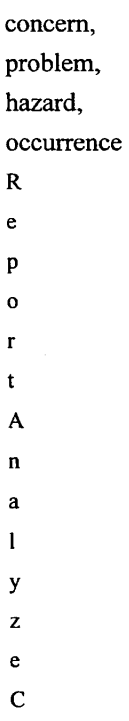
A safety management system will provide an organization with the capacity to anticipate and address safety issues before they lead to an incident or accident. A safety management system also provides management with the ability to deal effectively with accidents and near misses so that valuable lessons are applied to improve safety and efficiency. The safety management system approach reduces losses and improves productivity.

The basic safety process is accomplished in five steps:

1. A safety issue or concern is raised, a hazard is identified, or an incident or accident happens;
2. The concern or event is reported or brought to the attention of management;
3. The event, hazard, or issue is analyzed to determine its cause or source;
4. Corrective action, control or mitigation is developed and implemented; and
5. The corrective action is evaluated to make sure it is effective. If the safety issue is resolved, the action can be documented and the safety enhancement maintained. If the problem or issue is not resolved, it should be re-analyzed until it is resolved.

How does a safety management system differ from traditional approaches?

Implementing safety management systems does not involve Transport Canada imposing an additional layer of regulatory and safety oversight on the industry. Safety management systems incorporate the basic safety process, described above, into the management of an organization. The traditional flight safety approach depended on a flight safety officer (or department in a larger organization) independent from operations management, but reporting to the Chief Executive Officer or Chief Operating Officer of the company. The safety officer or department had, in effect, no authority to make changes that would enhance safety. The safety officer or department's effectiveness depended on the ability to persuade management to act. A safety management system holds managers accountable for safety related action or inaction.



o

r

r

e

c

t

Evalute

Document

Not

Resolved

Resolved

Figure 1 The basic safety process

The safety management system philosophy requires that responsibility and accountability for safety be retained within the management structure of the organization. The directors and senior management are ultimately responsible for safety, as they are for other aspects of the enterprise. This is the logic that underlies recent Transport Canada Civil Aviation regulatory initiatives. When they come into force, the new regulations will require certain aviation organizations to identify their 'accountable executive'. This is the person who has financial and executive control over an entity subject to the regulations. The accountable executive is the certificate holder. Should an organization hold more than one certificate, (eg., an operator who holds an air operator certificate and has an approved maintenance organization) there would be only one accountable executive.

The safety management system approach ensures that authority and accountability co-exist.

Some Features of Safety Management Systems

When an organization develops a safety management policy and procedures, they have to fit into the organization. Safety management has to be comprehensive, but should not be more complex than the rest of the company's management program. Safety management must be compatible, and preferably, integrated into the overall management scheme. The following list will be helpful to the manager who wants to know more about how to make safety management a reality. Most items in this list will be familiar to managers. They are already part of the safety landscape. The fundamental changes are concerned with roles and accountability of management and the regulator.

1. Senior management commitment
2. Safety policy
3. Safety information
4. Establishing safety as a core value
5. Setting safety goals

6. Hazard identification and risk management
7. Establishing a safety reporting system
8. Safety audit/assessment
9. Accident and incident reporting and investigation
10. Safety orientation and recurrent training
11. Emergency response plan
12. Documentation

Each element is briefly described below with examples and benefits.

Senior Management Commitment

Regardless of the size, complexity, or type of operation, there is no doubt that senior management plays a major role in determining the company's safety culture. Without the wholehearted commitment of management, any safety program will be ineffective. Safety management will succeed to the degree that senior management devotes the time, resources, and attention to safety as a core management issue.

Benefit - Solid commitment ensures that safety management is accorded sufficient resources and attention.

Safety Policy

Senior management commitment will not lead to positive action unless that commitment is expressed as direction. Senior management must develop and communicate safety policy that allocates responsibilities and holds people accountable for meeting safety performance goals. In some small organizations, policies may be informally communicated while in other organizations policy is documented and communicated through formal channels. Some aviation organizations are required by regulation to meet defined standards in the formulation and documentation of safety related policy. The relevant CARs should be consulted to make sure that required standards are met.

Safety Policy should include, at a minimum:

_ a clear declaration of commitment and objectives;

_ a means for setting safety goals and regular review of safety performance;

_ clear statements of responsibility applying to every department or functional area in the organization;

_ clearly stated accountabilities converging at the top of the organization;

_ a means for ensuring compliance with regulations;

_ a means for ensuring adequate safety management knowledge and skills at all levels; and

_ compatibility or integration with other management systems.

Once the policy is defined, procedures must be devised to implement the policy. Procedures must be consistent with policy and appropriate for the employees responsible for performing them. Well thought out procedures help ensure that practices are consistent with the policy.

Benefit - Management is confident that staff understand and accept that they have important roles in ensuring safety.

Safety Information

Management depends critically upon information to make decisions and lead the organization. Managers and staff should be able to access and use safety information relating to the organization's own performance. Therefore, management must establish a system to collect and analyze safety data. This would include:

_ safety goals and evaluation of progress towards those goals;

_ records of accidents and incidents including internal/external investigation findings and corrective actions;

_ safety concerns raised by employees including analysis and resultant action;

_ results of safety reviews and audits and when appropriate, corrective action; and

_ records of all safety initiatives or interventions.

The safety information system should be large enough and complex enough to meet the organization's needs. A small company or agency may be able to keep all the relevant information in a small number of files. A larger enterprise may be better served by automating the record keeping. Some larger companies may even dedicate full time staff to the safety information system. Managers and employees should also be looking outward and keep up-to-date on the latest developments in safety. Keeping current on safety provides a better background for understanding aspects of the organization's safety condition and developing novel solutions to difficult problems. This is accomplished by subscribing to safety related publications, making relevant Transportation Safety Board (TSB) accident investigation reports available, and encouraging staff to participate in safety related training, seminars and workshops.

Benefit - Safety data and information are available to the people who need it to do their jobs.

Establishing Safety as a Core Value

Safety is not accomplished solely by the owner, Chief Executive Officer, or any other individual in an organization. Safety involves everyone. A positive safety culture is invaluable in encouraging the kind of behaviour that will enhance safety. Positively re-enforcing safety conscious action sends the message that management cares about safety.

The best way to establish safety as a core value is to make safety an integral part of the management plan. This is done by setting safety goals and holding managers and employees accountable for achieving those goals. To be effective, goal setting requires practical, achievable goals which can be verified and safety goals are no different. Goals should be set and deadlines for meeting them established. Managers must follow through and hold those responsible to account for their progress toward the goals. Success or failure in meeting safety goals should be treated in the same way as success or failure at meeting any other types of goals.

Many organizations hold safety meetings from time to time. This is a good idea, but if safety is a core value, safety implications should be raised and addressed as a normal part of doing business. When operational or financial concerns are discussed, associated safety issues should be considered as well. For instance the selection of new equipment will probably involve evaluating factors like training, purchase price, operating costs, and maintenance. Safety aspects of the acquisition should also be considered. Requiring that safety be a part of every management decision underlines the importance of safety and ensures that safety is a normal part of the way all jobs are done.

Benefit - Staff become stakeholders in safety management, ensuring its effectiveness.

Setting Safety Goals

Goal setting is vital to an organization's performance. All organizations have their own ways of setting and expressing goals. In some organizations the goals are not stated very explicitly. Other organizations set goals formally and document the process. Regardless of how management goals are set, few organizations are good at developing safety goals. The most common weakness in setting safety goals is focusing on outcomes. This usually means counting accidents, but we know that safe companies can have accidents while less safe operations can be lucky and avoid accidents. Although the ultimate goal is 'no accidents', there are more precise and useful ways of measuring safety, especially in a safe system, than counting accidents.

Professor James Reason of the University of Manchester, a leading authority in the management of safety, compares managing safety to "fighting a guerrilla war in which there are no final victories". It is a never ending struggle to identify and eliminate or control hazards. We will never run out of things to do to make the system safer. Sound management requires that we identify them, decide how to achieve them, and hold ourselves accountable for achieving them. Risk management procedures can help managers decide where the greatest risks are and help set priorities. Sound safety goal setting concentrates on identifying systemic weaknesses and accident precursors, and either eliminating or mitigating them.

Benefit - Clearly stated goals lead to a commitment to action which will enhance the safety of an organization.

Hazard Identification and Risk Management

A hazard is a condition with the potential of causing injury to personnel, damage to equipment or structures, loss of material, or reduction of the ability to perform a prescribed function.

Risk is the chance of injury or loss. This concept includes both the likelihood of a loss and the magnitude.

Hazard identification and risk management should be undertaken, at a minimum:

_ during implementation of the safety management system and then at regular intervals;

_ when major operational changes are planned;

_ if the organization is undergoing rapid change, such as growth and expansion, offering new services, cutting back on existing service, or introducing new equipment or procedures; and

_ when key personnel change.

Transport Canada Civil Aviation has adapted the Canadian Standards Association Q850 decision-making process for risk management. The Civil Aviation approach calls for seven steps:

1. Initiate the Process
2. Perform Preliminary Analysis
3. Estimate Risk
4. Evaluate the Risk Activity
5. Control Risk
6. Take Action
7. Monitor Impact

Benefit - Hazard identification and risk management provide the information needed to control risk at acceptable levels.

Establishing a Safety Reporting System

Aviation is a dynamic industry and conditions are constantly changing. To alert management that something has changed, or a new hazard is emerging, organizations need input from all levels. Employees must have a

way to report hazards and safety concerns as they become aware of them and every employee must know how to report their concerns.

When an employee reports a concern or hazard, the report should be acknowledged and analyzed. Acting on reported safety concerns will build employees' confidence in the system. If, however, a reporting system is not maintained and attended to, people will quickly stop using it.

Some organizations will be required by regulation to institute a reporting system. A system that employees do not trust or use will not fulfill the requirements of the regulation.

Any safety concern should be reported, but here are some real life examples:

_ high workload during passenger boarding;
_ poor communication between operational areas;
_ crews rushing through checks;
_ inadequate checklists;
_ inadequate tool or equipment control;
_ difficulty obtaining parts;
_ feeling fatigued on certain schedules;
_ NOTAMS not being passed to crew;
_ in-flight turbulence;
_ unsafe ground movements;
_ poor communication within maintenance;
_ poorly designed task cards;
_ lack of emergency equipment, procedures and training;
_ emergency exit paths blocked;
_ vehicles left in fire lanes or other unauthorized area;

_ unruly passengers;
_ confusing signs;
_ poor lighting;
_ dispatching overloaded aircraft; and
_ failing to maintain operational control.

Not all safety concerns require a special reporting system. Some should be made on existing paperwork, such as reports or logs. Other hazards might not

fit well into existing reporting systems. It is fairly easy to create a form or process.

The report must be analyzed to determine whether there is a real threat to safety and if so, what needs to be done. When the issue requires action, that information must go to the person who has the authority to take the action. This preserves the accountability of the safety management system.

The credibility of the system is preserved when the outcome is fed back to the reporter. If it is decided that no action is appropriate, that information, and the reasons for that decision should be fed back to the reporter. What really matters is that all staff know how to report safety concerns and that their reports are acknowledged, analyzed, and resolved in a timely manner.

Benefit - Staff have a way to bring their safety concerns to the people who can do something about them.

Safety Audit/Assessment

Safety audits or assessments should be conducted regularly, and in some cases may be required by regulation. These assessments will ensure that correct procedures are being followed and resolve any problems or misunderstandings. Any safety assessment should include the activities of contractors engaged by the company where the services of the contractor might affect the safety of the operation. Examples could include maintenance organizations, people who accept cargo on behalf of your organization, or airport operators.

Small companies do not need a special department to plan and conduct regular internal audits. They do, however, need to know what is going on in the operation. Are staff following procedures, particularly when supervisors are not around? If not, why not? In a larger organization, a special group may be responsible for planning and conducting safety audits/assessments. In some organizations, the quality/inspection department would be responsible for planning and conducting audits. Regardless of who takes on the responsibility, an audit or assessment should be conducted regularly.

Benefit - Management is assured on a regular basis that policies, procedures and practices are correct and consistent, and is alerted when an area needs attention.

Accident and Incident Reporting and Investigation

Fortunately, accidents are rare. Incidents, however, are much more common. Furthermore, incidents and less serious accidents are often wake up calls that can alert employees and managers to hazards, risks, or possibilities that they had not considered before. Every incident and accident is an opportunity to learn valuable safety lessons. The lessons will be understood, however, only if the occurrence is analyzed so that managers and staff understand not only what happened, but why it happened.

Every incident and accident should be reported and investigated. The investigator, or team of investigators must be technically competent and either possess or have access to background information so that facts and events are interpreted accurately. The investigator should have the confidence of staff and the investigation process should be a search to understand how the mishap happened, not a hunt for someone to blame.

The investigation report must go to the responsible manager who has the authority to act on the findings.

Benefit - Your company learns from investigating incidents and is able to remove hazards or strengthen defences as required.

Safety Orientation and Recurrent Training

New employees should be trained in how safety is managed and encouraged to adopt the safety philosophy, policy, procedures, and practices of the company. Over and above the regulatory requirements for specific training and checks, ongoing technical training in each employee's own discipline should be accorded a high priority. The commitment to provide both relevant orientation training and ongoing refresher/recurrent training for all staff is an essential element of any safety program.

In a small company, sitting down with new employees, or briefing as you show them around and introduce the other staff members, may be a good way to introduce your company's safety philosophy. A larger company would be well advised to train all new staff on the company's approach to safety. It could be part of existing orientation programs or delivered separately by specialist staff.

Benefit - All staff understand how safety is managed and what is expected

of them to make it effective.

Emergency Response Plan

As stated previously, accidents are rare. This is good news. The bad news is that a good safety record can lull us into complacency so that if something really bad does happen, we may not be prepared to deal with it. Every aviation organization, operator, service provider, maintenance organization, and airport should have an emergency response plan. The survival of a company can depend on how it handles the first few hours or days following an accident. An emergency response plan outlines in writing what should be done after an accident happens, and who is responsible for each action. When the plan is adopted, relevant staff should be briefed on the plan and their responsibilities. Appropriate staff should receive training in emergency response procedures. The plan should be readily available and a copy should be at the work station of the person who normally answers the company telephone as this is likely to be the first person notified of an occurrence.

The Plan should:

_ be relevant and useful to people on duty at the time of an accident;
_ include checklists and emergency contact details;
_ be updated when contact details change; and
_ be exercised to ensure the adequacy of the plan and the readiness of the people who must make it work.

Benefit - Staff will know what to do in the event of an emergency or accident.

Documentation

The safety management program or system should be formally documented in appropriate manuals, directives and/or instructions.

Documentation should include:

_ a policy statement from the Accountable Executive;
_ the reporting chain and responsibilities of key personnel;
_ the hazard identification and risk management process;
_ the safety reporting process;
_ audit/review processes; and

_ all other activities of the program.

Records should be kept of:

_ all activities related to identification of hazards, risk assessment, and action taken;

_ results of all investigations of accidents and incidents, including analysis and action taken;

_ all safety reports issued or received including analysis and action taken

_ any safety recommendations;

_ findings of internal audits, assessments and program reviews; and

_ management action.

Documentation must be tailored to the needs of the organization. There are a number of commercially available database programs that help automate many of the functions so that more time can be devoted to safety and less to administration and clerical activities.

Benefit - Safety policy, responsibilities and procedures of the safety program are documented and available.

References and information sources

Hidden, A. (1989) Investigation into the Clapham Junction Railway Accident. UK Department of Transport.

Hudson, P. et al. (1994) Tripod Delta: Proactive Approach to Enhanced Safety. Journal of Petroleum Technology. 46. 58-62.

International Civil Aviation Organization. (1984) Accident Prevention Manual (ICAO, Montreal, Quebec, Canada).

International Civil Aviation Organization. (1998) *Human Factors Training Manual.* (Doc 9683) (ICAO, Montreal, Quebec, Canada)

International Civil Aviation Organization (1993) Human Factors Digest No. 7: *Investigation of Human Factors in Accidents and Incidents.* (ICAO, Montreal, Quebec, Canada)
International Civil Aviation Organization. (1993). Human Factors Digest No. 10: *Human Factors, Management and Organization.* (ICAO, Montreal, Quebec, Canada)
Reason. (1997) *Managing the Risks of Organizational Accidents.* New York: Ashgate.
Richard H. Wood. (1991) *Aviation Safety Programs: A Management Handbook.* Englewood, Colorado. Jeppesen Sandersen Inc
Maurino, DE., Reason, J., Johnston, N., & Lee, RB. (1995). *Beyond Aviation Human Factors.* Avebury Aviation, Hants, UK.
Waring, A., & Glendon, AI., (1998) *Managing Risk.* Toronto. International Thomson Business Press.