

出國報告（出國類別：考察）

參加 RAPS 使用者研討會

服務機關：行政院飛航安全委員會

姓名職務：副飛安官／官文霖

派赴國家：加拿大渥太華

出國期間：2005 年 6 月 26 日至 7 月 3 日

報告日期：2005 年 7 月 5 日

公務出國報告提要 系統識別號 C09402637

出國報告名稱：參加 RAPS 使用者研討會

頁數：42 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

出國人員姓名：官文霖

服務機關：行政院飛航安全委員會

單位：調查實驗室

職稱：副飛航安全官

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 94 年 6 月 26 日至 7 月 3 日

出國地區：加拿大渥太華市

報告日期：民國 94 年 7 月 5 日

分類號/目

關鍵詞：加拿大運輸安全委員會、飛航資料紀錄器解讀、飛航紀錄器。

內容摘要：

加拿大運輸安全委員會 (TSB) 於 1985 年開始研發飛航資料紀錄器解讀、分析與動畫系統 (RAPS)，2001 年 8 月以後，TSB 將 RAPS 產權技術轉移給 FlightScape 公司，以改善服務效率與研發更完善之系統。該解讀系統直至 2005 年共有 21 個政府機關，4 家飛機製造廠，加拿大航管單位，2 家私人公司，與 15 家航空公司加入會員。

目前，歐美等國之調查機關，我國及中國大陸，多數飛機製造商均使用相同的解讀系統 (RAPS/Insight)，它將有助於提升飛航事故調查之效率。基於持續擴展本會之飛航紀錄器解讀與分析能力，應逐年推薦本會年輕飛航紀錄器工程師參加飛航紀錄器解讀及分析訓練。並添購一套解讀系統 (Insight) 以分散工作負擔。我國調查實驗室已列全球五大實驗室 (美加法澳)，本會應致力於推動亞太地區飛航事故調查及飛安研發之合作及分享。

本文電子檔已上傳至出國報告資訊網。

出國報告審核表

出國報告名稱：參加 RAPS 使用者研討會		
出國人姓名	職稱	服務單位
官文霖	副飛航安全官	行政院飛航安全委員會
出國期間：94 年 6 月 26 日至 7 月 3 日		報告繳交日期：94 年 7 月 6 日
出國計畫主辦機關審核意見	<input type="checkbox"/> 1. 依限繳交出國報告 <input type="checkbox"/> 2. 格式完整（本文必須具備「目的」、「過程」、「心得」、「建議事項」） <input type="checkbox"/> 3. 內容充實完備 <input type="checkbox"/> 4. 建議具參考價值 <input type="checkbox"/> 5. 送本機關參考或研辦 <input type="checkbox"/> 6. 送上級機關參考 <input type="checkbox"/> 7. 退回補正，原因： <input type="checkbox"/> ①不符原核定出國計畫 <input type="checkbox"/> ②以外文撰寫或僅以所蒐集外文資料為內容 <input type="checkbox"/> ③內容空洞簡略 <input type="checkbox"/> ④電子檔未依格式辦理 <input type="checkbox"/> ⑤未於資訊網登錄提要資料及傳送出國報告電子檔 <input type="checkbox"/> 8. 本報告除上傳至出國報告資訊網外，將採行之公開發表： <input type="checkbox"/> 辦理本機關出國報告座談會（說明會），與同仁進行知識分享 <input type="checkbox"/> 於本機關業務會報提出報告 <input type="checkbox"/> 9. 其他處理意見及方式：	
層轉機關審核意見	<input type="checkbox"/> 1. 同意主辦機關審核意見 <input type="checkbox"/> 全部 <input type="checkbox"/> 部份_____（填寫審核意見編號） <input type="checkbox"/> 2. 退回補正，原因：_____ <input type="checkbox"/> 3. 其他處理意見：	

說明：

- 一、出國計畫主辦機關即層轉機關時，不需填寫「層轉機關審核意見」。
- 二、各機關可依需要自行增列審核項目內容，出國報告審核完畢本表請自行保存。
- 三、審核作業應儘速完成，以不影響出國人員上傳出國報告至「公務出國報告資訊網」為原則。

目次

一、目的與行程安排	4
二、過程	5
三、研討會心得	8
3.1 RAPS 使用者研討會	8
3.2 下一代飛航參數資料庫之發展	12
3.3 空中巴士對 Inisght 軟體之整合應用	12
3.4 跑道入侵案例探討	14
3.5 機場障礙物圖資之發展	15
3.6 Insight Animation 於地面載具事故之應用	16
3.7 Inisght 之未來發展	19
3.8 參訪 TSB 工程部實驗室	20
四、結論	23
附錄	25

一、目的與行程安排

由於科技日新月異，飛航紀錄器正處於新舊時代交替過程，各國的飛航事故調查機關的紀錄器專家都曾遭遇不同之問題，且擁有獨特的解決經驗。

本會每年例行參加 RAPS 使用者會議，此會議主要為集合全世界飛航紀錄器調查人員，飛機製造商，以及航空公司飛航資料監控（FDM）部門人員，共同討論飛航紀錄器解讀經驗及技術交流。本會派員參加 RAPS 使用者會議，為收集 RAPS 新版本資料，與各國飛航紀錄器解讀專家交流。今年（94）RAPS 使用者會議於加拿大渥太華市舉行。

日期	行程安排	搭程飛機班次	時間
06/26	台北 - 溫哥華	長榮航空 10	23:525 ~ 19:40
06/27	溫哥華 - 渥太華	楓葉航空 166	09:20 ~ 16:55
06/28 ~ 06/30	RAPS 使用者研討會		
07/01	渥太華 - 溫哥華	楓葉航空 139	18:55 ~ 21:10
07/02 ~ 07/03	溫哥華 - 台北	長榮航空 9	02:25 ~ 05:10

二、過程

會議地點：加拿大 渥太華市

主辦單位：Flightscape 公司（原加拿大運安會工程部）

協辦單位：加拿大技術研發中心(TDC)，加拿大運安會(TSB)，國際運協(IATA)，
Avionica 公司，DRS 公司。

RAPS 使用者研討會議程

Thesday June 28

- (1)8:50 - 9:00 Introduction 簡介 Mike Poole, Flightscape

- (2)9:00 - 9:10 Opening Remarks
Terry Burtch, Director General Investigations Operations, TSB/Canada

- (3)9:10-9:20 IATA Teaming Agreement IATA合作 David Mawdsley, Director of Safety, IATA

- (4)9:20-9:35 Radar Analysis (RADS) Update 雷達資料分析Larry Lachance, Director, Safety Evaluations and Investigations, NAV CANADA

- (5)9:35-10:20 Product Development Update 產品研發更新 Rob Runolfson, Flightscape

- (6)10:20-10:40 Coffee Break

- (7)10:40-11:00 Next Generation Parameter Databases 下一代飛航參數資料庫之發展 Rob Runolfson, Flightscape

- (8)11:00-11:25 New Concept for Handling Flight Data atBoeing 波音之飛航資料處理新觀念 Brian Predmore, Boeing

- (9)11:25-11:50 Airbus Integration Test Center 空客之整合中心 Yves Lebiannic, Airbus

- 11:50-13:15 Lunch

Moderator, Ted Givins,
Chief, Flight Recorders & Performance, SB/Canada

- (10) 13:15-13:40 Runway Incursion/Analysis & Animation
Dennis Grossi, NTSB 跑道入侵之分析與動畫
- (11) 13:40-14:10 B737-700 Unstable Approach 不穩定進場
Graham Liddy, Air Accident Investigation Board, Ireland
- (12) 14:10-14:30 New FDR Capabilities FDR 新功能
Wim Furster, The Dutch Safety Board
- (13) 14:30-14:50 New FDR Capabilities
Kevin, Kuessales, Army Aviation Centre, Australian Defense Force
- (14) 14:50-15:10 Update from Down Under 澳洲飛航資料解讀及分析現狀
Michael Hill, ATSB/Australia
- (15) 15:30-15:50 Flight Data Update ALPA飛航資料解讀及分析現狀
Corey Stephens, ALPA US
- (16) 15:50-16:10 Mishap and Animation Facility - Before and After 美國空軍之飛航事故動畫裝備
Jeff Barnette, USAF
- (17) 16:10-16:30 Transition to Insight 美國海軍之航資料解讀及分析換裝
Chip Brown, US Naval Safety Center
- (18) 16:30-16:50 CFIT Incidents 可控飛行撞地之事故
Major Jim Burger, DFS/Canada

19:00 Dinner Hosted by Flightscape

Wednesday June 29

- (19) 9:00-9:15 Business Development Overview Mike Poole, Flightscape

Moderator: Howard Posluns, Chief, Advanced Technology, Transportation Development Centre

- (20) 9:20-9:40 Safety Data Management & Analysis, 飛航安全資料管理及分析 David Mawdsley, Director of Safety, IATA

(21) 9:40-10:00 TDC Data Sharing R&D Study Tom Dunn, Transport Canada & Wayne Jackson, Flightsape

(22) 10:20-10:40 Data Research/Simulator Training 資料研究及模擬訓練
Martyn Roast, Oxford Aviation

(23) 10:40-11:10 IATA' s FDA Service IATA飛航資料解讀服務 Jill
Sladen-Pilon, IATA and Dion Bozec, Flightscape

(24) 11:10-11:35 FDA Program Status Zoom航空之飛航資料解讀及分析現狀
Captain Vic Charlebois, Zoom Airlines

11:35-13:00 Lunch

(25) 13:00-13:25 Cathay Pacific Safety 國泰航空之飛航資料解讀及分析現狀
Developments, Trevor Ng, Cathay Pacific

(26) 13:25-13:50 FDA Program Status Captain Nduati Njama, Kenya Airways

(27) 13:50-14:25 A310 Pitch Up Event A310異常上仰事件 Captain Mike
Dillolo, Air Transat

14:25-14:45 Coffee

(28) 14:45-15:05 FDA Program Update 西南航空之飛航資料解讀及分析現狀
Don Carter, Southwest Airlines

(29) 15:05-15:20 Wireless Download Technology 無線飛航資料下載技術
Gilles Landry, Avionica

(30) 15:20-15:30 Aircraft Performance Monitoring Study 航機性能分析

Thursday June 30

(31) 9:00-11:00 Tour of Transportation Safety Board of Canada
Laboratories. 參觀加拿大運輸安全委員會工程部實驗室

三、心得

3.1 RAPS 使用者研討會

加拿大運輸安全委員會 (TSB) 於 1985 年著手研發飛航資料紀錄器解讀、分析與動畫系統 (Recovery, Analysis and Presentation System, 簡稱 RAPS)。2001 年八月以後, TSB 將 RAPS 產權技術轉移給 FlightScape 公司, 目的為改善服務效率與研發更完善之系統。該研討會也由 RAPS Users Conference 改為 Flightscape Users Conference。

RAPS 原屬於各政府航機失事機關所用, 直至 2005 年共有 21 個政府機關, 4 家飛機製造廠 (波音, 空中巴士, Bombardier, Saab), 加拿大航管單位 (NavCanada), 2 家私人公司 (英國 Cranfield 大學, UAG Aerospace), 與 15 家航空公司 (Air Moldova, Air New Zealand, Air Transat, Carpatair, Cathay Pacific, El Al, Evergreen International Airlines, First Air, Harmony Airways, IATA, Northwest Airlines, Southwest, US Airline Pilots Association, WestJet, Zoom Airlines) 加入會員。

本次 Flightscape 使用者研討會約有 130 餘人參加, 共有 30 篇論文, 以下說明出席機關或單位表達之意見。

國際航空運輸協會 (IATA), 今年與 Flightscape 公司策略聯盟, 將於 2005 年 10 月對 IATA 會員提供飛航資料解讀分析服務 (Flight Data Analysis, FDA), 詳附錄一。

荷蘭運安會 (DSB) 屬於 Multi-Model 運輸安全委員會, 全會人員約 30 人, 航空調查人員 7 人。荷蘭運安會職掌該國航空, 鐵路, 公路, 船隻及管線等運輸安全調查。未來, 將擴大職權含概建築物之公共安全調查。目前, 荷蘭運安會只有 Insight Analysis 模組。

澳洲運安會 (ATSB) 屬於 Multi-Model 運輸安全委員會, 載具紀錄器實驗室有 4 人, 3 人負責飛航紀錄器, 1 人 (Michael Hill) 負責火車及輪船紀錄器。

長久以來, 加拿大運安會 (TSB) 於飛航紀錄器之解讀技術研發極為出色, 但是缺乏飛航性能專業人員。過去, 他們仰賴加拿大國科會 (NRC); 當下, 他們多仰賴於 Flightscape 公司的技術委託服務。

TSB 工程部新上任的 TED GIVINS 主管極力整頓工程部之紀錄器及載具性能小組, 目前共有 6 人, 1 人為負責火車紀錄器, 另 1 人負責飛航性能, 其餘 4 人專業為飛航紀錄器。TSB 執行長 Terry Burth 於會中開場致詞指出:「因應未來 5 年改善飛航安全之目標, TSB 今年開始執行兩大計劃—未來飛航紀錄器編碼及解讀; 飛航性能研發桌上型 6DOF 飛航模擬器。」

Insight 軟體模組現況

Insight/Animation, Insight/Analysis 及 Insight/Recovery 3 項 PC 版軟體, 相當於 RAPS UNIX 版本的飛航動畫, 飛航資料分析及磁帶式飛航資料採集模

組。它的 License 採用 3 組不同的機碼，須向 FlightScape 申請，**新版的 Insight 軟體模組的更新功能說明詳附錄二。**

Insight/FDM 是新的模組，將於 2005 年 10 月推出。主要用於航空公司飛航資料例常性解讀，事件偵測，及統計等功能。以 .NET 為基礎，使用者有許多客製化功能。Insight/FDM 也是 IATA 提供給會員作飛航資料解讀之平台。

Insight/Animation	flight animation system
Insight/Analysis	Fully data analysis
Insight/FDM	Event Detection, Trending and Reporting
Insight/Recovery	ARINC data tape decoding and bit recovery
Insight/Sim	6 DOF aerodynamic modeling
Insight/ProView	Interactive animation viewer (laptop)
Insight/View	Freely distributed viewers
Insight/View with ADG	Proview with flight path generation

目前，政府使用者最關心的議題是 Insight License 控管，及 RAPS 不再有升級版兩大問題。澳洲 ATSB 使用 License Sever 去啟動 Insight Analysis，Insight Animation，Insight Recovery。ATSB 有 4 組 Insight License，但有多於四台電腦裝 Insight。美國 NTSB 有 4 組 Insight Analysis 及 Insight Animation 的 License，並繼續使用 RAPS 工作站。法國 BEA 有 4 組 Insight Analysis 的 License，有 2 組 Insight Animation 的 License。加拿大有 4 組 Insight License，中國 CAAC 有 2 組 Insight License。相形之下，本會實驗室至少有三名人員從事飛航資料解讀及分析工作，但只有 1 組 Insight License，實有增購必要，並藉以培養人才，分散工作負擔。

往年，研討會中 Flightscape 的技術人員都會介紹及教導新版的軟體功能，今年則沒有這類活動。因為，**Flightscape 公司對新版軟體的功能教導，將採取收費訓練方式。**地點可在 Flightscape 公司的訓練課程中，或使用者軟體安裝地點。圖 1 為 Insight Animation 飛航動畫成果展示；圖 2 為 Insight Analysis 參數表列功能，以滑鼠按住參數檔頭可作交換位置；圖 3 雷達資料動畫處理系統(Radar Data De-briefing System, RADS)

Aircraft Configurations including:

- ✓ FFD file development/validation
- ✓ CSV data import
- ✓ Data Import Automation
- ✓ Animation template
- ✓ Instrument models
- ✓ ADG configuration (automates data processing, flight path creation, derived parameter)

✓ Airport and terrain models



圖 1 Insight Animation 飛航動畫成果展示[PC 1.5 版]

Insight Analysis - gen-1.tab

File Edit View Tools Help

Time (seconds)	GMT (sec)	A/T ENGAGE (0-NOT ENGA,1-ENGAGE)	AIR/GROUND (0-GROUND,1-AIR)	A/P OFF (0-ON,1-OFF)	RADIO HEIGHT (FEET)	ALTCMB (ft)	COMPUTED AIRSPEED (KNOTS)	GROUNDSPEED (KNOTS)	DRIFT ANGLE (deg)	ROLL ANGLE (DEG)
172396.0	08:44:00	NOT ENGA	GND	OFF	-1	196	45.0	10.0	11.0	-0.4
172397.0		NOT ENGA	GND	OFF	-1	196	45.0	9.5	11.0	-0.4
172398.0		NOT ENGA	GND	OFF	-1	196	45.0	9.5	11.0	-0.4
172399.0		NOT ENGA	GND		-1	196	45.0	9.5	11.0	-0.4
172400.0	08:44:04	NOT ENGA	GND		-1	196	45.0	9.0	11.0	-0.4
172401.0		NOT ENGA	GND		-1	196	45.0	9.0	11.0	-0.4
172402.0		NOT ENGA	GND		-1	196	45.0	8.5	11.0	-0.4
172403.0		NOT ENGA	GND		-1	196	45.0	8.5	11.0	-0.4
172404.0	08:44:08	NOT ENGA	GND		-1	196	45.0	8.5	11.0	-0.4
172405.0		NOT ENGA	GND		-1	196	45.0	8.5	11.0	-0.4
172406.0		NOT ENGA	GND		-1	196	45.0	8.0	11.0	-0.4
172407.0		NOT ENGA	GND		-1	192	45.0	8.0	11.0	-0.4
172408.0	08:44:12	NOT ENGA	GND		-1	192	45.0	8.0	11.0	-0.7
172409.0		NOT ENGA	GND		-1	196	45.0	8.0	11.0	-0.7
172410.0		NOT ENGA	GND		-1	196	45.0	8.0	11.0	-1.1

recovery 737-1.fdd

圖 2 Insight Analysis 參數表列功能

Flightscape
The World's Most Advanced System

RADS
Radar Analysis Debriefing System

- Fully customizable and interactive 3D display of radar data
- Terrain or airspace chart backdrops
- Integrated voice and subtitle playback
- Color coded targets change to highlight events (e.g. loss of separation)

圖 3 雷達資料動畫處理系統(Radar Data De-briefing System, RADS)

3. 2 下一代飛航參數資料庫之發展

論文發表者：Rob Runolfson, Flightscape

今年 2 月美加地區的飛航紀錄器調查員與飛機製造商於加拿大渥太華召開下一代飛航參數資料庫會議，與會單位包括：波音，空中巴士，Bombardier，Saab，BEA，NTSB，TSB。該會議的主旨在強化 Insight 使其能解讀所有的 ARINC 格式之飛航資料，發展 API 程式使各式飛航參數資料庫能匯入 Insight 的 FFD 中，會中也提到 ARINC 新規範的飛航參數資料庫之標準化格式－FREDS (Flight Recorder Electronic Documentation Standard)。目前，Insight 能處理的飛航參數資料庫只有 FREDS，Boeing CSV，Airbus Calibration；會中統計出 Insight 近期要發展的飛航參數資料庫匯入 API 程式共有 16 種。

以空中巴士的飛機為例，A300-600 約紀錄 250 項參數，A320 約紀錄 250 項參數，A340 約紀錄 700 項參數，A330-200 約紀錄 900 項參數，A340-600 約紀錄 1400 項參數，A380 約紀錄 2500 項參數。

3. 3 空中巴士對 Inisght 軟體之整合應用

論文發表者：Yves Le Biannic, Airbus Flight Test Center

空中巴士對 Inisght 軟體之整合應用論文中提出，以發展 A340 為例，飛行測試中心對飛航資料之應用分四階段，說明如下（詳圖 4）：

- (1) AIDS/FDRS Integration Test，(出廠前有 10 版本 150 項整合測試項目)
- (2) AIDS programming，(出廠前有 60 組程式 600 項測試項目；出廠後有 20 組程式 200 項測試項目)
- (3) FDR Verification，(出廠前有 187 種 FDR 規格 1100 項 FDR 參數確認項目；出廠後有 110 種 FDR 規格 160 項 FDR 參數確認項目)
- (4) Event analysis，(出廠前有 120 種事件偵測 125 項事件分析分類法；出廠後有 410 種事件偵測 600 項事件分析分類法)

Biannic 也提出空中巴士對飛航業者要求的工作，如何整合飛測中心及設計部門之專長，根據飛航業者提供的飛航資料進行研究分析，並找出解決之道，詳圖 5。因為，空中巴士 2004 才開始使用 Insight Analysis，Insight Animtion，主要的目的為與飛航事故調查單位使用相同的飛航紀錄器解讀及分析系統，以避免調查過程中出現同一飛航資料紀錄器，若因飛機製造商使用不同的解讀裝備，造成解讀資料之差異與紛爭。

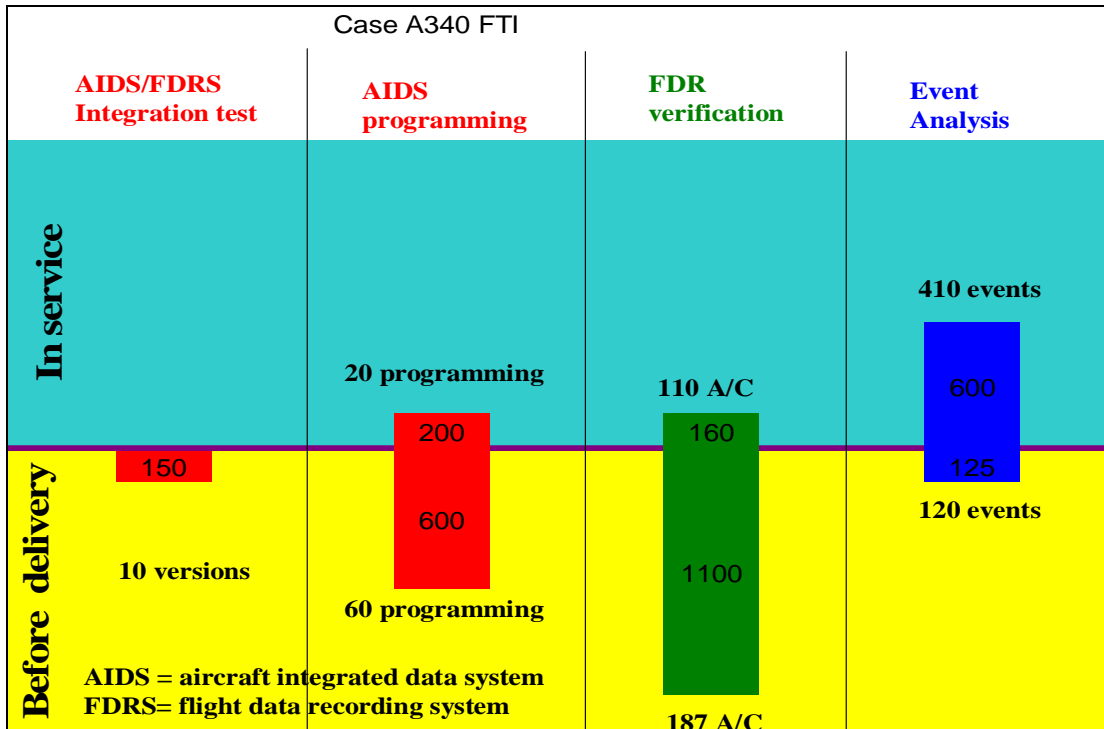


圖 4 空中巴士飛行測試中心對飛航資料之應用階段

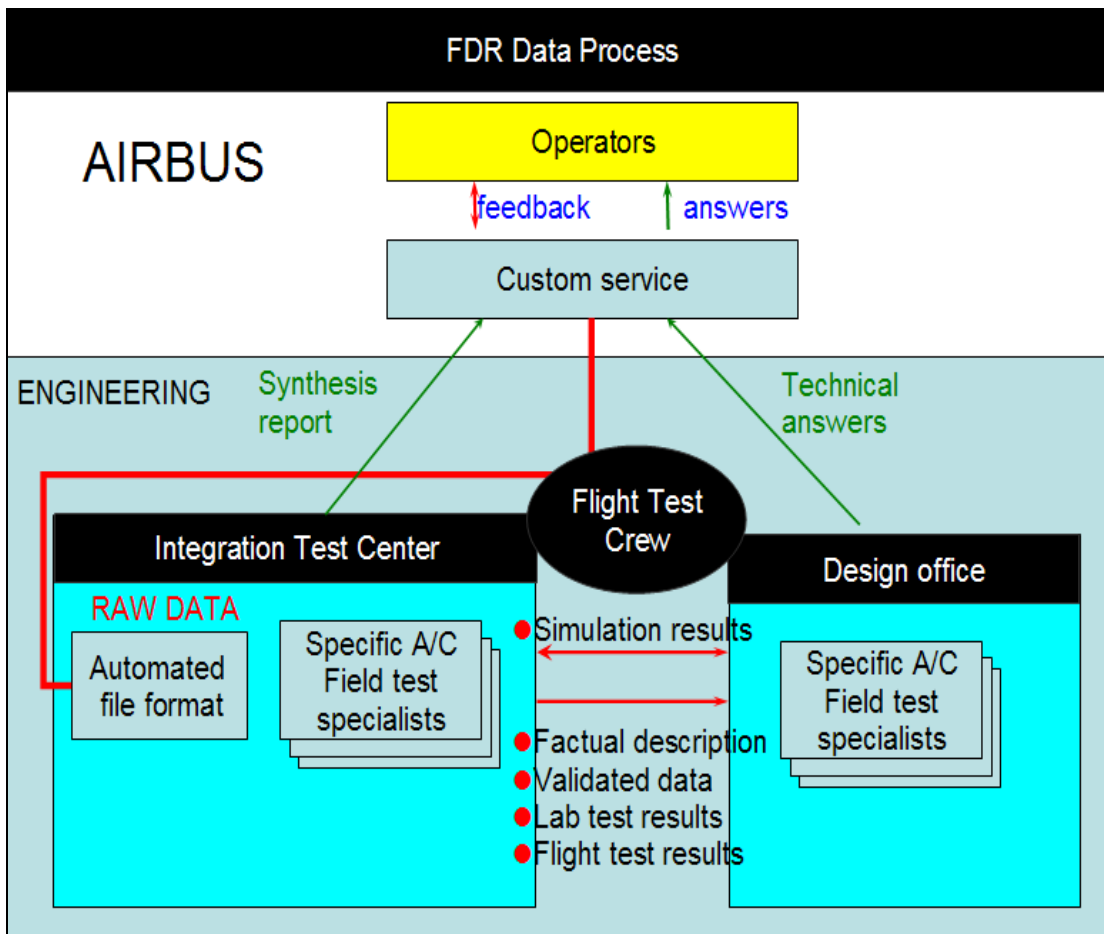


圖 5 空中巴士對飛航業者提供飛航資料分析研究之流程

3. 4 跑道入侵案例探討

論文發表者：Dennis Grossi, NTSB

NTSB Dennis 提出的跑道入侵案例為 2004 年 8 月 19 日發生於洛杉磯機場 Asiana Airlines Flight 204 (波音 747) 與 Southwest Airlines Flight 440 (波音 737)。事故發生時，Asiana 204 班機準備近場著陸時，發現 24L 跑道端的 Southwest 400 班機正滑入跑道，因而放棄著陸採重飛避讓。

事故發生時，塔台的場面雷達 (AMASS) 有紀錄到 AMASS 之警告聲響，及兩機與塔台管制員間的通話。此一動畫中的波音 747 飛航軌跡使用航管雷達資料，波音 737 之地面滑行軌跡是由飛航參數的加速度資料積分後獲得，如圖 6 所示。飛航資料解讀過程中，因 Southwest 的 FOQA 資料解讀委託 Flightscape 公司，所以事故發生後 NTSB 從 Flightscape 取得解讀資料庫 737 FFD，洛杉磯機場精密地型，衛星影像，及飛機模型，進而提升解讀及動畫製作的效率。

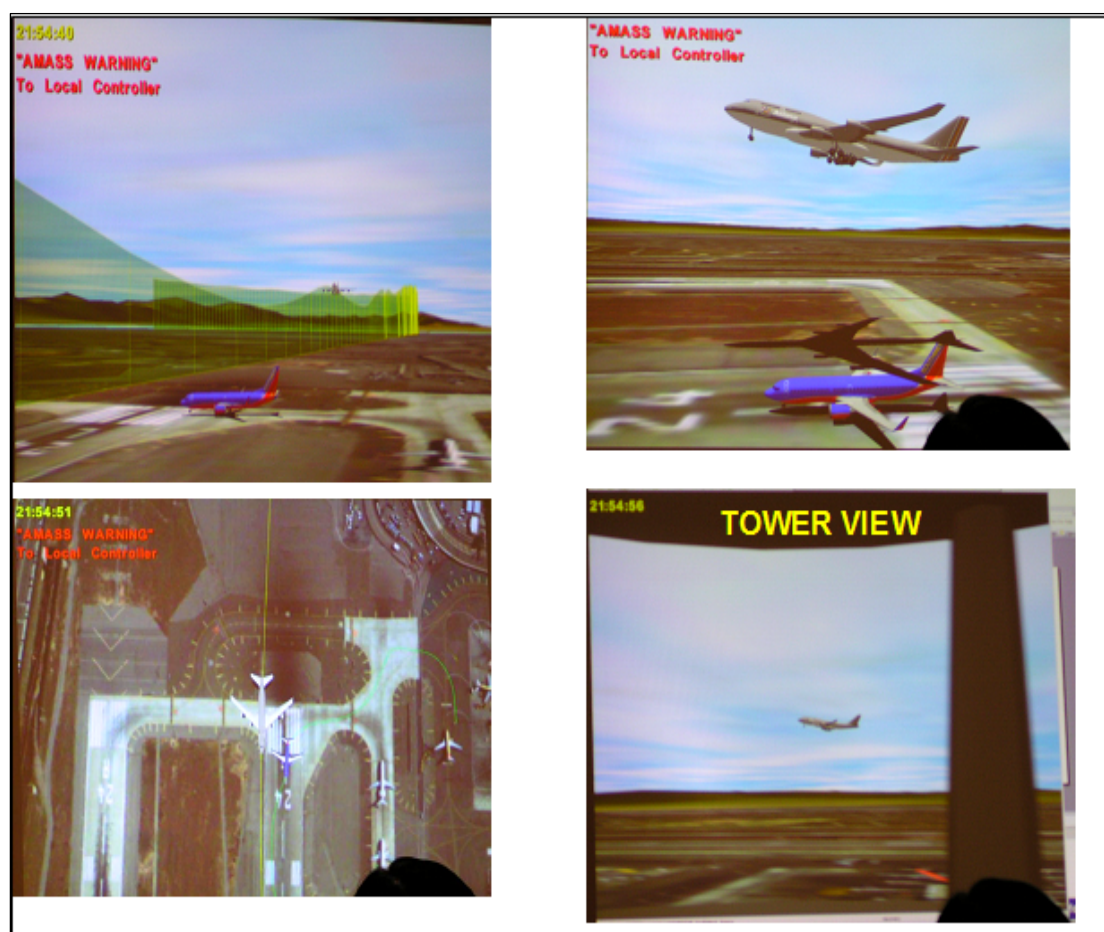


圖 6 波音 737 與 747 於洛杉磯機場發生跑道入侵飛航事故動畫

Dennis 結論時指出，因為飛航事故調查單位，飛機製造商若使用相同的解讀系統，則可以大幅提升調查效率，並減少因解讀系統不同產生的爭議及準確度等問題。實際的例子，包括：Flash AIR 2004.01 於埃及外海失事；及上述跑道

入侵事件。

3. 5 機場障礙物圖資之發展

論文發表者：John Synnott, IATA

國際航空運輸協會(International Air Transportation Association, IATA)發展的機場障礙物(Airport and Obstacle Database, AODB)已有12年了,該成果已成功整合於美加地區FAA的場面安全監控中,且Flightviz的機場障礙物模組也有許多美加地區的航空業者用於與FOQA資料整合。目前,IATA發展的機場障礙物有新的計劃稱為SkyVu。SkyVu為IATA與美國衛星影像公司(Space Imaging)合作開發四種與機場障礙物有關圖資¹(如圖7):

- ✓ Cat.1 - Imaging
 - ✓ 提供機場地帶10x10公里的IKONOS衛星影像1公尺解析度(彩色及多波段),
 - ✓ 作為FOQA資料之飛航軌跡與機場場面圖套合分析,
 - ✓ 作為MANPD分析應用(與恐怖攻擊預防有關)
 - ✓ 作為航機於場面活動發生不符合操作程序時調查用途,
- ✓ Cat. 2 - Digital Terrain and Obstacle Models
 - ✓ 根據衛星影像立體像對,製作機場場面模型,包括:地型,人工及自然的障礙物模型,
 - ✓ 這些數值模型也包含了機場邊界,人工及自然的障礙物模型的高度,航路,航機起降程序圖(SID, STAR²)等。
- ✓ Cat. 3 - Airport Mapping Databases
 - ✓ 根據Digital Terrain and Obstacle Models製作之機場場面移動電子地圖,
 - ✓ 避免跑道入侵(RUNWAY INCURSION)應用,
 - ✓ 適合於EFB, Aerodrome Mapping and Vis-Sim應用,
 - ✓ 規格:全球高解析度機場數位地圖,DO-272格式,可以作3D檢視,支援各式GIS軟體(ARCINFO, Microstation, AutoCad, Mapinfo),
 - ✓ Airport Mapping Images and models include: Runway centerline, Taxiway centerline, Runway shoulder, Taxiway shoulder, Exit lines, Hold lines, Stopway, Clearway,

¹ Constructed to DO-272 and DO-276 standards

² Standard Instrument Departure (SID). For landing these paths are called Standard Terminal Arrival (STAR).

Deicing areas, Parking stand (all), Helipad, Helipad FATO, TOLF, Helipad threshold, Significant bodies of water.

- ✓ Cat. 4 - Flight Simulation Visual Database
 - ✓ 整合上述三種成果- imagery, terrain model, airport map,
 - ✓ 應用於新型飛行模擬器之視覺系統，及提供既有飛行模擬器之地型資料庫更新，
 - ✓ 發展低價位的飛行訓練裝備 (fixed training device, FTD)
 - ✓ 考慮與 Flightscape 的 Insight 產品整合，
 - ✓ 提供政府部門之飛航事故調查，FOQA 視覺化動畫模擬，IAT 簽約用戶之飛航資料分析 (FDA) 等應用。

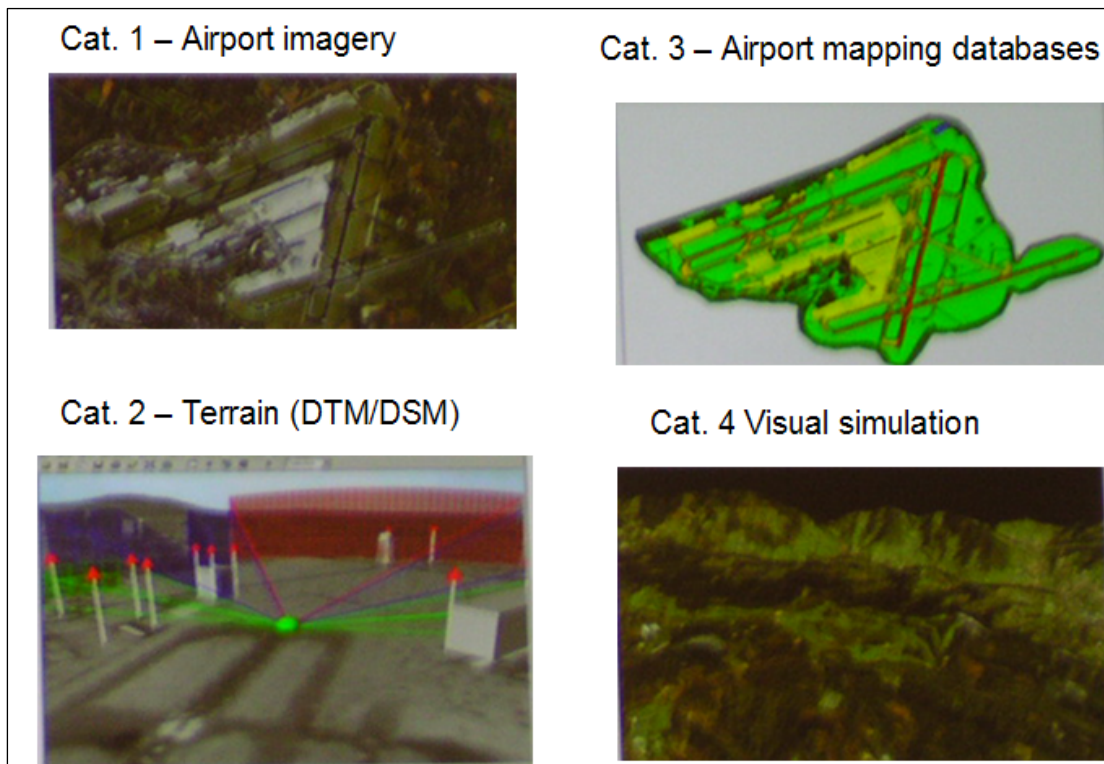


圖 7 IATA 研發之 SkyVu 軟體圖層比較

3.6 Insight Animation 於地面載具事故之應用

論文發表者：Michael Hill, ATSB

澳洲運安會 (ATSB) 屬於 Multi-Model 運輸安全委員會，載具紀錄器實驗事有 4 人，3 人負責飛航紀錄器，1 人 (Michael Hill) 負責火車及輪船紀錄器。ATSB 已有多次經驗將火車及輪船紀錄器之解讀資料，以 Insight Animation 作動畫並提給委員會作參考 (詳圖 8/9)。

ATSB 的論文也指出，他們也開始應用 3D SCANNER 作事故現場的地形模型，

並將其結果轉入 Insight Animation。不過，他們遭遇若干技術困難。由於本會於華航 611 調查中對 3D SCANNER 有良好的工作經驗，因此提供 ATSB 一些解決方案。

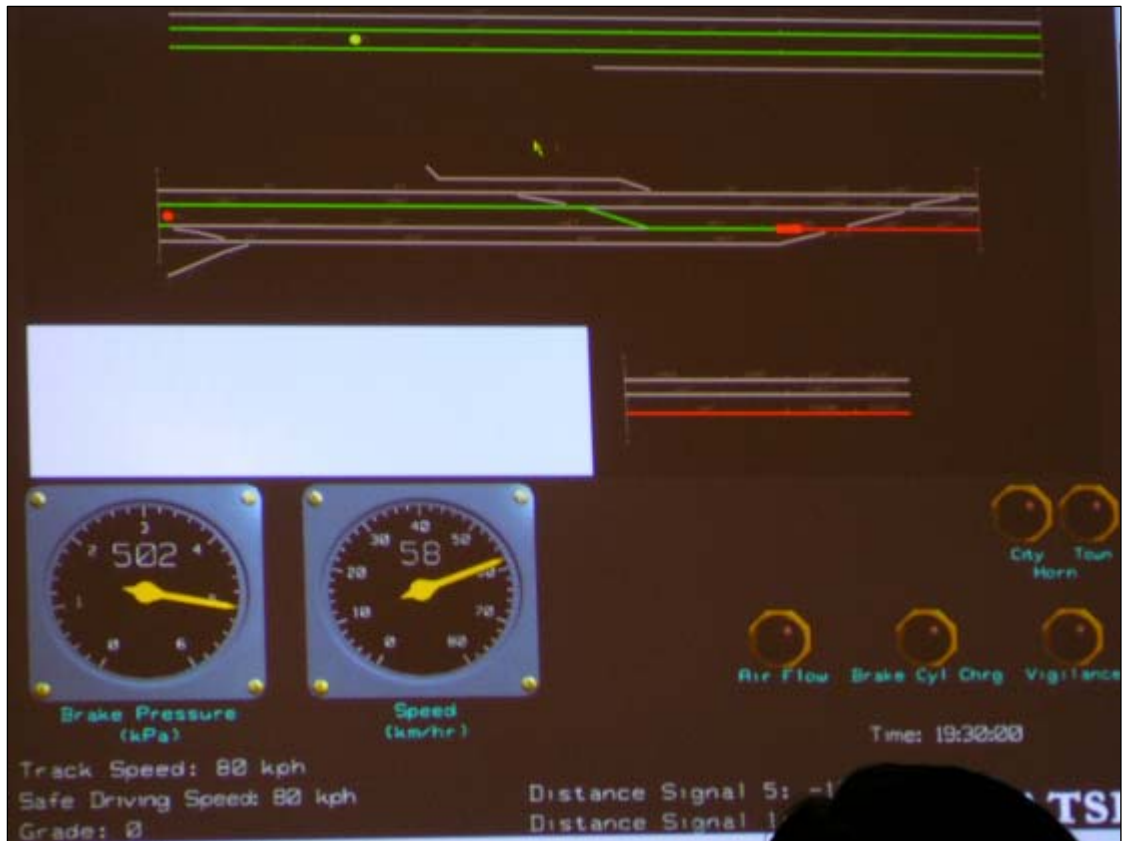


圖 8 火車紀錄器飛航動畫（上圖為兩輛火車鐵軌之管控，下圖為儀表及燈號）

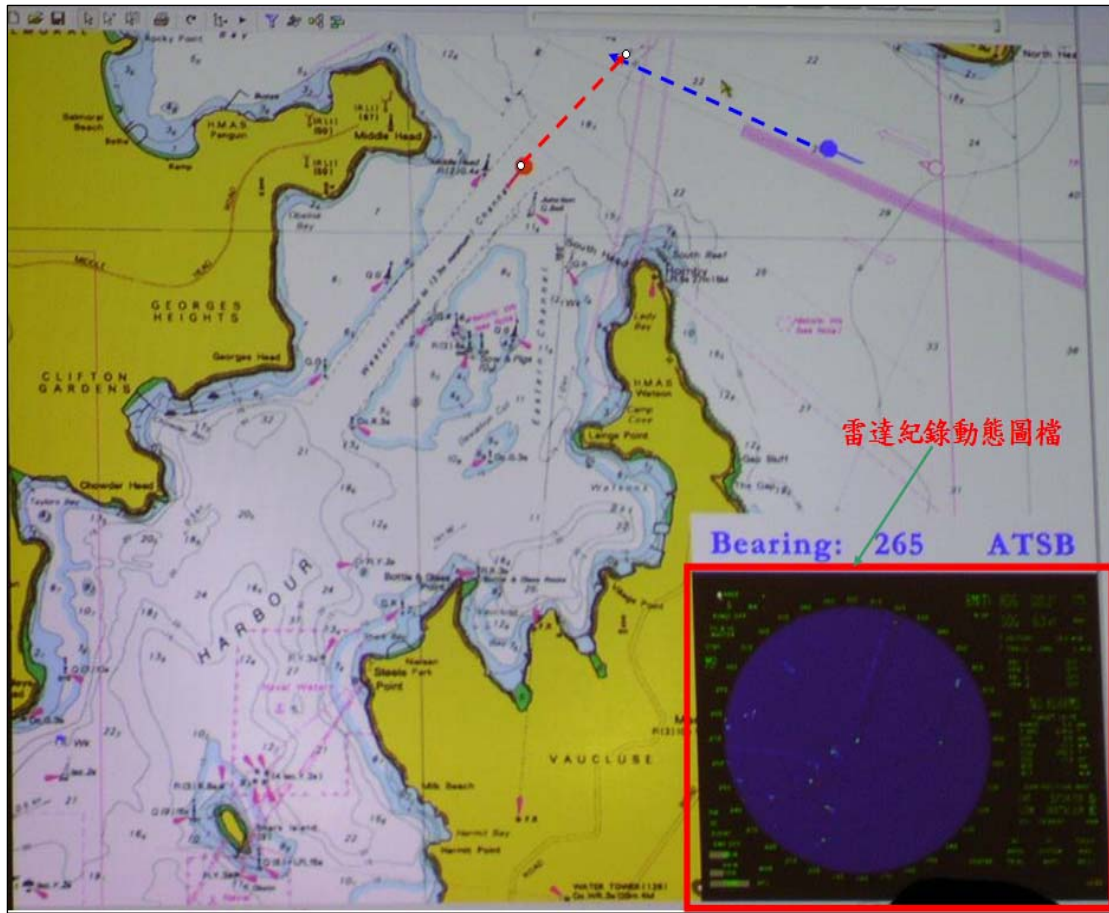


圖 9 輪船紀錄器飛航動畫（右下圖雷達航跡 JPEG FORMAT，15 秒計一張）

3.7 Inisght 之未來發展

研討會最後，Flightscape 公司說明了未來優先發展的工作項目，計有十項。其中，前四項為本會多年來建議執行，且自行持續研發的項目。列表說明如下：

1. 整合地形建模及視覺化編輯工具 (Global Mapper Vs. SkyVu and AODB)；
2. 支援 OPENFLIGHT 三維模型格式；
3. 支援地形資料庫動態載入及切割功能 (Terrain database paging)；
4. 自動化機場產生模組；
5. 強化與整合吉普森航圖；
6. 支援多語言文件說明功能；
7. 進一步整合及同步處理動畫，繪圖，表列；
8. 持續改善資料庫完整性 (飛機模型，儀表，ffd 資料庫)
9. 研發自動化資料產生引擎 (automatic data generation、ADG) 及特定飛機及資料組的定義模組 (definition sets of A/C and data sets for insight/analysis)
10. 改善 Insight/Animation

3.8 參訪 TSB 工程部實驗室

一行約 15 人花了 3 小時參觀 TSB 工程部實驗室，與會人員無不對 TSB 工程部感到佩服。TSB 的結構金相實驗室各式的分析儀器均屬國際一流等級，包括：顯微鏡，電子顯微鏡，掃描電子顯微鏡、X 射線能譜分析儀、光學金相顯微鏡、顯微硬度計，紅外光譜分析儀等設備。此外，也有油料分析實驗儀器，MOA 多元素分析儀、水分測定儀、運動粘度測定儀等一系列先進的油料分析設備，可以提供滑油和液壓油中含量、雜質、水分、酸值、粘度、微生物等測試服務。參觀過程中，TSB 結構金相實驗室解說了幾項金屬疲勞(fatigue)的案例，圖 10 為 ATR42 發動機旋槳因金屬疲勞後造後斷裂切面。

TSB 工程部新上任的 TED GIVINS 主管極力整頓工程部之紀錄器及載具性能小組，目前共有 6 人，1 人為負責火車紀錄器，另 1 人負責飛航性能，其餘 4 人專業為飛航紀錄器。TED 指出，全世界的調查實驗室中只有英國 AAIB 保有解讀金屬鋼絲紀錄器 (WIRE RECORDER) 的裝備，如圖 11。

TSB 工程部尚有一工程技術發展組，專門從事現場物證鑑定及還原等研發工作，例如：火燒後及泡水之文件處理，文件是否被竄改及還原，以事故現場空照圖製作 3D model 等(圖 12)；；以 3D MAX 發展動畫模擬系統，從是「IF - THEN sequence」研究(圖 13)。

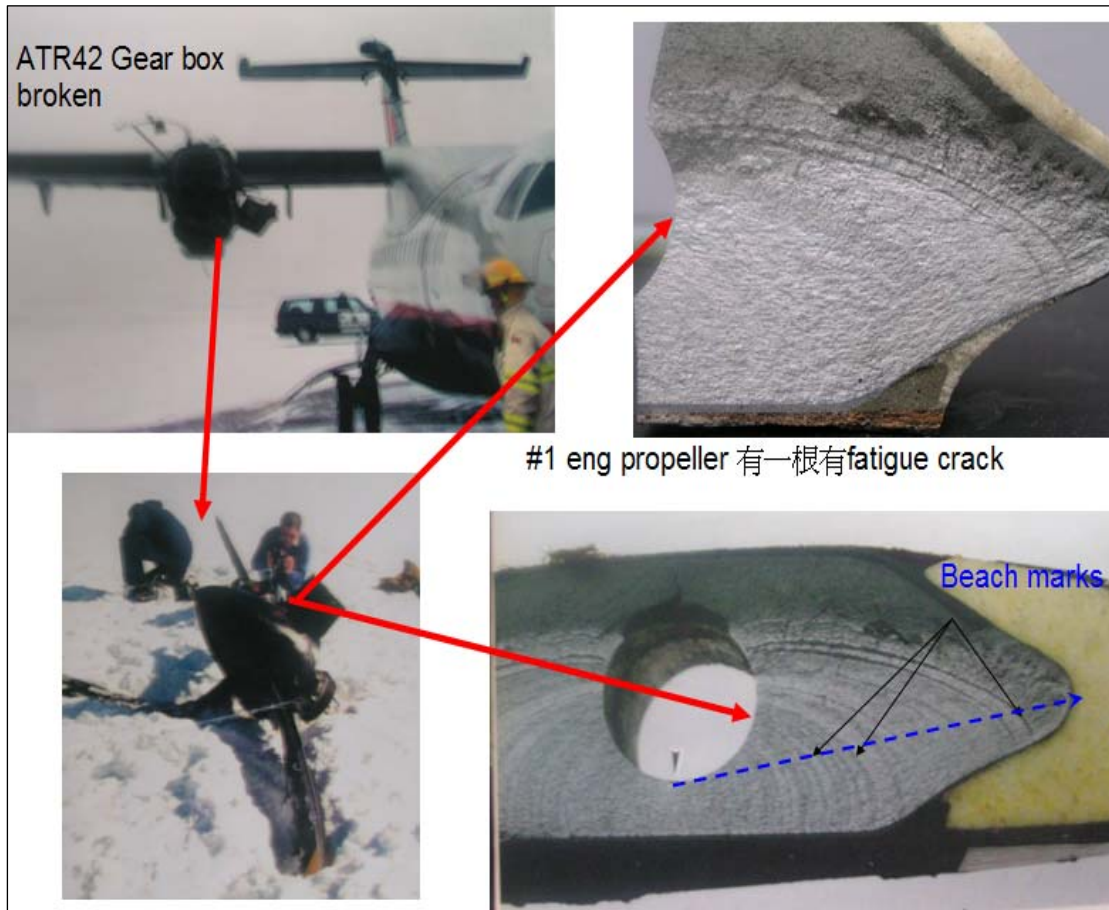


圖 10 ATR42 發動機旋槳因金屬疲勞造後斷裂切面



圖 11 金屬鋼絲紀錄器

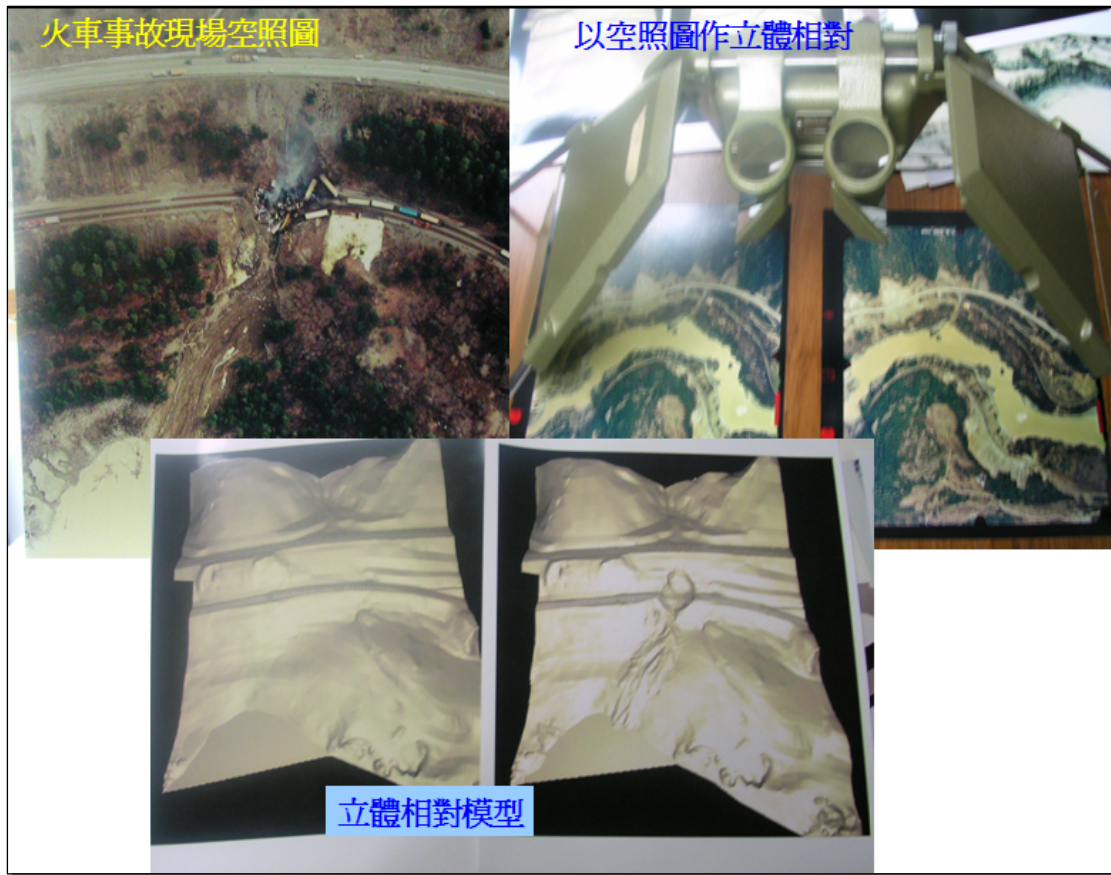


圖 12 火車事故現場空照圖製作 3D model



圖 13 3D MAX 動畫模擬火車與卡車相撞

四、結論

本次「參加 RAPS 使用者研討會」，行程圓滿且收穫豐富，提出四項心得：

- I. 參訪加拿大運輸安全委員會最大的收穫，經過與他們的調查人員私下交流及討論後，獲得一些飛機於溼滑道面下衝出跑道調查案的內部及飛機製造商之分析報告（因涉智慧財產權，將另案於會內提報）。
- II. 飛航解讀分析與動畫系統（RAPS）原屬於各政府航機失事機關所用，直至 2005 年共有 21 個政府機關，4 家飛機製造廠，加拿大航管，2 家私人公司，與 15 家航空公司加入會員。
- III. 2005 年 RAPS 使用者研討會約有 130 餘人參加，共有 30 篇論文。調查機關與飛機製造商對 Insight 解讀及分析之需求一致，對飛航事故調查之效率將可大幅提升。
- IV. **本會調查實驗室之研發項目，與其它同業類似**
 - ✓ 研討會中，澳洲提出 3D Scanner 之建模應用，本會於 2003 年 ISASI 會議發表之殘骸三維軟體重建系統，三維測繪技術於民航領域之應用研究均屬類似研發領域（發表於 2004 年航太學術研討會，2005 年民航季刊）。
 - ✓ 研討會中，IATA 提出 SkyVu 的機場障礙物圖資成果。其實，本會實驗室多年來致力整合衛星影像及地形，航路，航道，發展了 3D GIS 應用於飛航事故調查領域，提出 AI-GIS Layer 作法。雖然，規模雖小但其成果已可自由運用與 Insight animation 之整合，實領先 IATA 及 Flightscape 之研發進度。（相關論文發表於發表於 2004 年智慧型運輸系統學術研討會，2004 年航太學術研討會中）
 - 爲了更有效整合 Insight animation 之地形精密度，Flightscape 資深工程師 Bob Hoyle 透露他們內部正在研究如何將免費的精密衛星影像（Quickbird, Landsat），及全球地形(NASA SRTM data)轉入 Insight animation 之中。私底下，也將本會實驗室近半年未花任何費用的研發結果傳授 Flightscape。該結果已使印尼委託的調查，及 Flightscape 感到驕傲。

職提出五點建議如下：

- I. 未來派員參加研討會，盡量以發表論文與交換心得方式進行。藉以持續提升本會國際聲譽，並分享調查的學習心得（Lessons Learned）與飛安建議（Safety Recommendations）。

- II. 基於持續擴展本會之飛航紀錄器解讀與分析能力，應逐年推薦本會年輕飛航紀錄器工程師參加 Flightscape 舉辦的訓練課程。並添購一套 Insight Analysis, Insight proview 以分散工作負擔。
- III. 我國調查實驗室已臻全球五大實驗室（美加法澳），本會應致力於推動亞太地區飛航事故調查及飛安研發之合作及分享。積極整合進行中的調查技術相關研究計畫，並爭取更多的經費來推動未來之持續研發需求。
- IV. 積極參與歐美國家正在研討的相關飛航安全研發議題，如：桌上型飛航模擬器研發，下一代飛航參數資料庫之專家會議，派員參加現代化飛航紀錄器解讀及分析訓練（加拿大國科會 NRC 提議，SMITH 航太主辦）。
- V. 為提升本會於結構及航空材料領域之專業調查能力，建議未來編列預算派員至加拿大運輸安全委員會工程部受訓。

附錄

附錄一 IATA 與 Flightscape 的 FDA 服務內容

附錄二 Insight 1.5 版 軟體更新功能列示

附錄一 IATA 與 Flightscape 的 FDA 服務內容

IATA LAUNCHES INTERNATIONAL WEB BASED FLIGHT DATA ANALYSIS SERVICE - Signs multi-year agreement with Flightscape Inc.

April 28, 2005 - As part of its continuing investment in safety, the [International Air Transport Association](#) (IATA) has signed an agreement with Flightscape Inc. to launch a [Flight Data Analysis](#) (FDA) service. This new service enables carriers to meet the International Civil Aviation Organization (ICAO) directive that calls for the incorporation of an FDA programme into airlines existing accident prevention programmes.

This service is part of IATA's Safety Strategy to improve industry safety while reducing IATA members costs of operation and enhancing operational efficiency, said Guenther Matschnigg, Senior Vice President, Safety, Operations and Infrastructure with IATA.

The FDA service will improve safety margins by highlighting non-standard circumstances as well as generating significant savings by leveraging a pool of industry experts and premier Flight Data Analysis solutions. The value of FDA will be further enhanced by IATA's unique position to share lessons learned across the airline community to increase global industry safety levels.

The airline retains the intimate control and ultimate responsibility for their FDA programme. The service brings together a comprehensive suite of tools and expertise to unlock the value from airlines' s flight data. This saves airlines from having to recruit internal flight data expertise and associated systems by providing direct access to the very best analysts and methodologies available today, said Matschnigg.

The IATA FDA Service will be powered by Flightscape, recognized in the industry for leading edge flight data analysis tools and expertise. Flightscape currently operates a successful service for several airlines, which will serve as the platform for IATA to enhance its safety data and analysis capabilities in support of its airlines. The new relationship recognizes that many of the processes used in accident investigation are equally applicable to a proactive FDA programme, said Mike Poole, Managing Partner of Flightscape.

FDA is the newest addition to IATA's existing proactive safety tools, such as the Safety Report, the Safety Trend Evaluation, Analysis & Data Exchange System (STEADES) and the IATA Operational Safety Audit (IOSA) programme.

IATA Safety Data Management and Analysis products are founded on trust and dialogue with the airlines, spanning 40 years in accident analysis and prevention, and including the only global safety incident database, said Matschnigg. air Transport is the safest mode of mass transportation. 2004 was our safest year ever and we are committed to make it even safer. IATA has long recognized that companies with strong safety cultures are also leaders in operational efficiency. An FDA programme is the epitome of the synergy between safety and operational improvements. Good safety management is good management, and it's essential.

IATA leads, represents and serves the airline industry. Its 265 member airlines comprise 94% of scheduled international air traffic.

Flightscape, based in Ottawa, Canada, is a flight safety company that provides expertise in flight data playback, analysis and flight sciences. Flightscape develops software tools that enable the effective study and understanding of recorded flight data to improve safety, maintenance and flight operations.

附錄二 Insight 1.5版 軟體更新功能列示

FlightScape 2005年5月推出新版的INSIGHT軟體 ver 1.5，其中存在於舊版的問題已有大幅改進，茲列示說明如下：

Insight Analysis-GENERAL

- A Memory tab has been added to the Tools->Options Dialog to allow caching of Frame Data. Caching Frame Data into memory could significantly increase the performance of Insight Analysis when Frame Data is accessed over a network. 用來提升巨大飛航資料處理，飛航動畫內地型及衛星影像的Rendering 效能。
- The processing speed for loading large amounts of frame data has been significantly improved.
- Automatic Data Generation has been added to the Tools menu.適合於飛航資料批次處理用
- Function Editor has been added to the Tools menu.需先裝Borland C+ Compiler，x:\Program Files\Flightscape\Compiler。x:\Program Files\Flightscape\Insight Analysis\functions，為C原始碼置放路徑。
- The application now notifies the user of the license expiration 30 days prior to the expiry date.
- The last opened project automatically gets reopened from the registry on application start up.
- File Selection Dialog behavior has been improved.
- The Site directory now contains a functions folder. i.e. x:\flightscape\projects\2005\B737400_ADAM_NTSC\functions
- Site directories created in RAPS are now recognized as valid Site directories.
- The reset button on dialogs that contain color widgets now resets the color on the Color Preview Box.
- If a File Dialog's initial directory doesn't exist, the dialog defaults to a folder one level up, if that location doesn't exist then it sets the initial location to Windows "My Documents" folder.
- Insight Analysis handles importing a project by double clicking on an RPX file.
- The file history list under the File menu displays a hint window when hovering over the file name that shows the entire path of the selected file.

- The Frame Data Selection Dialog no longer produces assertion failure after selecting a different FFD file for the project.
- The Frame Data Selection Dialog remembers the previous search when it is reopened within the same project. The search is cleared when switching to a new project, FFD file, or Recovery directory.
- The Project Import File Dialog now retains the last visited folder location while the application is running.
- An already open Text Properties Dialog now properly gets updated when a different
- Loading multiple DC_COMBINED parameters at once now works correctly.
- The %U, %L and %B formats can now be used without having to specify additional formatting options. For example, %U can be used instead of having to specify %U(%H:%M:%S).
-

Insight Analysis-Data Analysis

- Workspace files with more than 100,000 observations are displayed on multiple pages. The whole data set can be navigated using a slider to select which portion of the data to view.
- When editing values in Data Analysis pressing the Return key will allow the next value to be edited.
- When loading a Workspace file from frame data for the first time, on the “Workspace from Frame” dialog the “Start Time” and “End Time” fields are pre-filled with the time range that is stored in the Master Index.
- The text on the View->History Dialog no longer contains invalid characters.
- On the Math function dialogs the time range fields initially are pre-filled with the time range for the entire Workspace file.
- Viewing the History of a newly created Workspace file no longer causes an access violation.
- Entering invalid input into the Calculator no longer causes an access violation.
- Access violations no longer occur when using “Constant” values in Speed Conversions.

Insight Analysis-Data Exchange

- Data Exchange has been enhanced to allow for the selection of a parameter such as GMT or Frame Counter to detect missing time, rather than using only the subframe number.
- Unpacked binary data import has been enhanced to support variable header lengths.
- CSV Import now copies the format specified in the configuration file into the output Workspace file.
- If the Time parameter exists in the CSV file it is given precedence over the rest of the time parameters (Hours, Minutes, Seconds) when creating the time column for the output Workspace file.
- The Data Import File Dialog now remembers the path of the last selected data file after application restart.
- Thales EQAR data can now be imported.
- Removed the Honeywell QAR option from the frame input data type since it is the same as the Unpacked Binary format.
- Unpacked Binary Frame files with .dat extensions now import correctly.
- When importing a CSV file, X value special formats specified in the configuration file or the CSV file are now used in the created Workspace files as the time formats.
- The Workspace file output has been moved from the Physical to the Logical Frame output selection.
- The title on the ASCII Bitstream and the Honeywell DLU options screen now gets updated properly.

Insight Analysis-FFD Editor

- The invalid warning message is no longer produced after creating a new parameter and trying to add subframe and word after adding a conversion.
- A CSV export option has been added for the parameter list display.
- Binary representations of sync codes are now correct.
- Access violations no longer occur when testing a conversion.

- If the display format field is left blank when adding or modifying a parameter, a default format is now assigned.
- Assertion errors are no longer produced after creating multiple parameter duplicates.
- Printing in the FFD Editor now uses the standard Windows print dialog, and prints all the parameter information displayed.
- When printing selected parameters the last parameter selected now gets printed as well.
- The dc_COMBINED function now handles signed parameters, zero and one overlapping bits.
- Subframe, Word, Bit locations and Number of Bits can now be selected in the Sort and Display fields options.
- Sort and Display field settings are now saved to the registry.
- Deleting multiple parameters no longer fails if the parameter's name is displayed in the second column.
- The special conversions C file (dc_convert_special.c) in the FFD Editor compiles correctly in all cases.
- Delete, Duplicate, Merge and Save options as well as searching options (such as Search/Restore/Sort/Display Fields) are disabled when the parameter property dialog is open.
- Searching for a specific group of parameters and deleting a parameter from the displayed list no longer causes an access violation.
- When a new parameter or duplicate parameter is added - it is now set to Not Compiled by default.
- Attempting to import a Boeing CSV file after changing the Column Heading no longer causes an access violation.
- Exiting with the Cancel option on the Save Prompt dialog no longer causes an access violation.
- Deleting the contents of the dc_convert_special.c file no longer causes an access violation.
- When saving a FFD template, the calibration directory is now saved in the template.
- Adding Superframe parameters no longer produces an assertion error.
- Entering zero as a sync code now works correctly.

Insight Analysis-Flight Data Scan

- If a value of 0 is entered for the "Minimum Event Duration", the scan will detect instantaneous events. Events of only 1 sample, such as a peak vertical acceleration, will be detected.

Insight Analysis-Master Index

- An error message is displayed if the FFD file is not set or doesn't exist for the current project.
- An error message is now displayed when trying to add a Frame file with no subframes.

Insight Analysis-Named Ranges

- When closing the Named Range dialog by pressing the Cancel button, a warning message is displayed if the named range list is modified.
- Start and End match item display color has been fixed.
- Named Range field now gets cleared if either the Start or End Time has been changed.

Insight Analysis-Plotting

- If any object's color would be the same as the background color when added to the plot, the color will be set to the "inverted color" instead.
- The Time Label keeps the relative position to the grid when the grid is moved, and no longer gets repositioned when the page size is changed.
- Time based lines now pan with the rest of the plot.
- The panning rate has been improved for large time ranges.
- Copy style from text to parameter and line to parameter now copies all

the required attributes correctly.

■ PDF files can now be saved using File->Save As and selecting the Adobe PDF file type.

- When changing a parameter name in the Object Manager with more than one parameter, the parameter order is no longer switched.
- Creating a new plot with the settings from the default Plot file now works correctly in all cases.
- The Time value on the Playback Control bar now gets updated while panning.
- System fonts are no longer anti-aliased for better RAPS compatibility.
- Panning stops if it reaches the minimum or maximum range of all available data.
- When plotting a frame parameter that is not “User Validated” in the FFD file, it is now correctly displayed as a grey dotted line.
- The “Invert Colors” feature in Plotting has been improved to use hue, saturation and luminance (HSL) instead of RGB.
- Printing problems have been resolved.
- The border that was being drawn around the plot has been removed.
- A “Floating point division by zero” error no longer occurs when setting the number of Major or Minor Ticks in the Grid Properties to 0.
- Thickness of Parameter Resolution now works correctly.
- When “Clip To Grid” is turned off for Time Based Text, it works properly on both sides of the plot
- Movement of the mouse cursor with Time Based text and lines is now synchronized.
- Grid lines, Axis lines and Ticks are no longer anti-aliased.

- Workspace files can be added to a plot even if they are contained in a subdirectory of the “eng” directory.
- Switching a converted frame parameter to raw sets the format to %.Of instead of clearing the display format field.
- When text is added to a plot by importing it from a CSV file, it uses the text style that is defined in the default Plot file.
- The default bounding box margins for text have been changed from 0 to 5.
- New text and lines have the same default static position mode.

- A new line now has a default thickness of 2 and has an arrow at one end.
- Rotating Time based Text using the mouse now rotates in the correct direction.
- When the Group folder name has been changed, Text and Line object Group names are properly updated as well.
- When multi-selecting objects in the Object Manager the pop-up menu is no longer available.
- Delete now works for multiple folders in the Object Manager.
- Moving objects from one folder to another in the Object Manager now works correctly. Text and Lines can be properly moved from folder to folder and copying the styles works correctly.
- Insight Analysis no longer crashes when switching between plots that are read-only and not read-only.
- When importing RAPS plots the line thickness conversions are now handled properly.
- Saving a parameter line thickness as default now produces correct line thicknesses.
- Wrap limit now works correctly.

Insight Analysis-Tabular

- Drag and drop now works even after enabling Alternate X.
- Column width is retained after drag and drop.
- Column resizing issues are fixed.
- Added support for exporting to the CDF format.
- On the Time Properties Dialog, “Step Size” now uses the FDAU information in the FFD file to increase or decrease the time.
- Named Range changes now only take effect when the Apply or OK button is clicked.
- When Alternate X is enabled, the context menu (Properties, Delete) is not shifted.
- Parameter titles that span more than three lines get displayed properly.

- An hour glass cursor has been added to indicate when data is being loaded.
- The pop-up menu is no longer available for an empty Tabular file.
- Deleting the last parameter in a newly created Tabular file no longer causes an access violation.

Insight Animation-General

- A Graphics tab has been added to the Tools->Options Dialog to allow significant performance increases and rendering quality (Smooth Edges, Texture Sharpening, Cache Models and Fast Render optimizations).
- Performance when rendering complicated instrument models has been improved.
- The application displays a warning if video card drivers are needed.
- Restriction on the window aspect ratio has been removed to allow animations to fill the entire screen or multiple screens.
- Added audio support for ISV files.
- The Frame rate indicator (FPS) has been removed from the Status Dialog and has been added to the Status bar on the application window.
- ISV files can now be opened from read-only locations such as CDs.
- ISV files can be opened even when the user does not have administrator access privileges.
- The application now notifies the user of the license expiration 30 days prior to the expiry date.
- If Insight Animation is closed by clicking File->Exit, the recently opened file history is now properly updated.
- The file history list under the File menu displays a hint window when hovering over the file name that shows the entire path of the selected file.
- The processing speed for loading large amounts of frame data has been significantly improved.
- If multiple models reference the same texture, the textures are not loaded multiple times, improving performance.
- The last opened project automatically gets reopened from the registry

on application start up.

- File Selection Dialog behavior has been improved.
- [The Site directory now contains a functions folder.](#)
- Site directories created in RAPS are now recognized as valid Site directories.
- An access permission error message is no longer displayed on start up if the Site directory's model folder is empty.
- When loading an animation template the name of the template file in the Title bar of the application window now gets updated.
- The Properties Dialog for newly added models now correctly displays the model name in the window border.
- [When saving an animation as an ISV file, the ISA file remains the active file.](#)
- Open project doesn't cause the application to crash if a previously opened project's folder location doesn't exist anymore.
- Opening a template file no longer causes any exceptions or odd behaviour.
- The Project Import File Dialog now retains the last visited folder location while the application is running.
- If a File Dialog's initial directory doesn't exist, the dialog defaults to a folder one level up, if that location doesn't exist then it sets the initial location to Windows "My Documents" folder.
- Insight Animation handles importing a project by double clicking on an RPX file.
- The same File menu options are available for an ISV file opened from within a valid project as for an ISA file.
- The Frame Data Selection Dialog remembers the previous search when it is reopened within the same project. The search is cleared when switching to a new project, FFD file, or Recovery directory.
- The Object Manager no longer causes an access violation if file reading fails.
- The "Import" option has been removed from the Object Manager Data Folder and
- Data Exchange has been added to the Tools menu.
- The Terrain Import Dialog has been improved to allow selection of a region from a World Map image.

- In the Terrain Import Dialog all Latitude and Longitude values can be entered to 6decimal places of accuracy.
- The Shadow Visible Toggle functionality on the Font Properties Dialog has been fixed.
- Fonts set to italic are no longer displayed as bold.
- The reset button on dialogs that contain color widgets now resets the color on the Color Preview Box.
- On the Playback Control bar 0 is now accepted as a valid start time value.
- The Data Set, Path and Parameter context menus no longer contain a “Reread” option. A “Refresh” button has been added to the main Edit menu and Toolbar for consistency with other Insight applications.
- ISV files now correctly save all image textures.
- The Apply button on the Contrail Properties Dialog now functions correctly.
- When loading an animation with a smaller time range than a previously loaded animation, the current time is no longer set to the end of the time range.
- The last line of a CSV file imported into Subtitles now imports correctly.
- Adding longer than 80 character length lines to the Subtitle Text no longer causes an access violation.
- Access violations no longer occur when a new animation is created while one of the Object Manager’ s dialogs is still open.
- Surface Configuration file color scales now work correctly.
- Surface Configuration file “Use vertex colors” setting is now correctly saved.
- Rotation now works correctly for Y and Z axes in the Object properties.
- When a Scene Object is connected to a path, translations and rotations are now applied in addition to the path X/Y/Z translations and roll/pitch/heading rotations. In previous versions the Scene Object translations and rotations were ignored in this case.
- If the name of the parameter is being changed to an invalid name in the Object Manager a warning message is displayed and the name remains the same as before.

- In the Sparks Dialog the Y value of the length and position entry fields are no longer inverted.
- The default camera zoom has been changed to 30.

Insight Animation-Automatic Data Generation (ADG)

- All ADG functions now update the parameter descriptor in any output Workspace files to match the ADG Workspace file name.
- If no takeoff or landing is detected, ADG sets the flight time to the beginning of the path.
- ADG functions are no longer run if the data set time range has been changed.
- ADG now allows Frame parameters to be used directly in addition to Workspace files.
- ADG_Correct_Alt_Near_Ground() now handles different Landing and Take-Off pressure altitudes.
- Improved the vertical alignment on runways.
- ADG_Fix_Bad_Data() now handles Min/Max and Data Spikes simultaneously.
- ADG no longer crashes when using the path creation functions with an empty
- Workspace file (one that contains header information, but no data) as input.

Insight Animation-Data Exchange

- Data Exchange has been enhanced to allow for the selection of a parameter such as GMT or Frame Counter to detect missing time, rather than using only the subframe number.
- Unpacked binary data import has been enhanced to support variable header lengths.
- CSV Import now copies the format specified in the configuration file into the output Workspace file.
- If the Time parameter exists in the CSV file it is given precedence over the rest of the time parameters (Hours, Minutes, Seconds) when

creating the time column for the output Workspace file.

- During CSV import if the Sort keyword is specified in the Configuration file and an empty Workspace file is created, Insight Animation no longer tries to sort the empty file and in doing so causing the import to fail.
- The Data Import File Dialog now remembers the path of the last selected data file after application restart.
- Thales EQAR data can now be imported.
- Removed the Honeywell QAR option from the frame input data type since it is the same as the Unpacked Binary format.
- Unpacked Binary Frame files with .dat extensions now import correctly.
- When importing a CSV file, X value special formats specified in the configuration file or the CSV file are now used in the created Workspace files as the time formats.
- The Workspace file output has been moved from the Physical to the Logical Frame output selection.
- The title on the ASCII Bitstream and the Honeywell DLU options screen now gets updated properly.

Insight Animation-Model Import

- The Model Import Dialog always displays the selected model properties.
- Models are no longer created in the wrong directory.
- An option has been added to allow normals defined in the OBJ file to be used.
- Changed the default value for smoothing from 0.5 to 0.3.
- A normals calculation bug has been fixed.
- Units selection now works correctly.
- Proper column spacing has been added on the Surfaces tab.
- Performance has been improved significantly so Model Import no longer appears to hang on the import of certain OBJ files.

Insight Animation-New from Fleet Wizard

- The Data Import now uses the parameter (PRM) file name specified in the Fleet file.
- The Start Time now correctly displays the minimum data range if it is other than 0.
- The Time widget is now properly updated, no longer causing an error while producing Workspace files.
- The New from Fleet Wizard no longer pops up after opening a file by double-clicking on it.
- If the New from Fleet Wizard is used to create an animation with previously imported data, the “Finish” button is now enabled without data import, using the Workspace files that were previously created.
- The Data Exchange Wizard is now used if defaults for the specified data for import are unknown.
- The overall time range is now determined from the project including Frame Data and Workspace files.
- When choosing a Start time greater than zero the current time in the animation is set correctly.
- The FFD file specified in the Fleet file is now used instead of auto-selecting one from the project.

Insight Animation-Path Creation

- Path Create functions have been updated to allow the selection of Frame Data as input parameters.
- Latitude/Longitude flight paths can now be created.
- If an error occurs while filling out the details in the Path Create Dialogs, the main dialog no longer closes after the error message is displayed.
- The Path creation dialogs now retain their previous settings, and only get reinitialized if the Recovery directory for the specific Data Set that the Path is part of is changed.
- The Path output parameter location now defaults to the “recovery/eng” folder instead of the “recovery” folder.

Insight Recovery

- Insight Recovery is a new application being released with Insight 1.5.
- Insight Recovery is an ARINC flight data editor that allows interactive editing of frame data and viewing of the converted engineering units on the fly.
- With Insight Recovery it is possible to access frame data by “logical” time or load physical bitstream data by blocks.
- Waveform data digitized from tape based FDR’ s can also be viewed. Insight Recovery records all changes made to a file for future reference.

Insight ProView

- A Graphics tab has been added to the Tools->Options Dialog to allow significant performance increases and rendering quality (Smooth Edges, Texture Sharpening, Cache Models and Fast Render optimizations).
- Performance when rendering complicated instrument models has been improved.
- The application displays a warning if video card drivers are needed.
- Restriction on the window aspect ratio has been removed to allow animations to fill the entire screen or multiple screens.
- Added audio support for ISV files.
- The Frame rate indicator (FPS) has been added to the Status bar on the application window.
- ISV files can now be opened from read-only locations such as CDs.
- ISV files can be opened even when the user does not have administrator access privileges.
- The application now notifies the user of the license expiration 30 days prior to the expiry date.
- The Tool bar at the top of the screen no longer crops off the top portion of the animation.
- Insight ProView maintains its own File History list.

- If Insight ProView is closed by clicking File->Exit, the recently opened file history is now properly updated.
- The file history list under the File menu displays a hint window when hovering over the file name that shows the entire path of the selected file.