AT-3 飛行模擬機 AT-3 Flight Simulator

General Introduction

分系統功能簡介 *Description of Sub-system*

主要特色

- 性能飛行。
- 儀器飛行。
- 緊急操作程序訓練。
- 雙機編隊飛行訓練。
- 採用AT-3實機飛行氣動力數據，飛操性能模擬與真飛機幾乎無差異。
- 座艙配置真實反應實機線上構型。
- 採用數位電動力感系統，以模擬實機操縱桿之力量回讀感受。
- 採用180° ×44° 視角之柱狀銀幕，以提昇虛擬實境視覺感。
- 視效資料庫採用高解析度之航照與衛星照片貼圖，模擬場景逼真
- 完美的影像頻道平滑化處理效果。
- 中英文人機操作界面，系統操作簡便。
- 採用開放式系統架構，利於未來系統擴充或構型提昇。
- 採用標準商規件，裝備維持與零備件籌補無虞。
- 系統操作自動化，三分鐘內可以完成系統開機。

主計算機系統

- 負責即時模擬環境的建立與執行飛行模擬軟體模組計算。
- 提供系統監控畫面以確定系統是否正常運作。
- 一部標準工業型處理器。
- 1000 Mbps乙太網路。
- Linux開放式作業系統，設計具可擴充性。

音效圖像電腦系統

- 一部標準工業型處理器。
- 負責模擬環境音效與警告音響。
- 採用3D電腦圖像技術繪製虛擬儀表，以取代實體儀表裝備。

Key Features

- Functional flight training.
- Instrument flight traininhg.
- Emergency and abnormal procedures training.
- Formation flying training.
- Accurate aerodynamic flight model.
- All the instruments, control panels and mechanism are identical with those of the real aircraft.
- Utilizes Digital Electric Control Loading system to simulate the force feedback of flight control.
- Utilizes 180 degrees by 44 degrees of curved screen to enhance the virtual reality.
- Visual database utilizes full color, high resolution geo-specific aerial photography and satellite Imagery, to produce high fidelity scenes.
- Advanced edge blending to produce a seamless image under day and night mode.
- The Chinese/e/English user interface is convenient for Chinese user.
- Open system architecture, designed for growth and aircraft concurrency with minimal effort and cost.
- Maximum use of Commercial Off-The-Shelf (COTS) hardware and software.
- The system can be brought up in 3 minutes.

HOST Computer System

- The host computer is responsible for creating real time environment and executing flight simulation model calculation.
  Provides system monitor mode to make sure the system is running normally.
- One industrial-grade PC.
- IEEE802.3 1000 Mbps Ethernet network.
- Linux Open Operation System, Upgradeable for the future.

Sound and graphic system

- One industrial-grade PC.
- The sound system is responsible for simulating all the sound created by the aircraft, which includes engine noise and communication system.
- The graphic system is responsible for creating the virtual instruments, which to substitute the real instruments.

教官台系統

- 全系統之控制中心，可控制各分系統之開關機以及執行飛行訓練時之各項功能設定。
- 提供課程選項與學員飛行狀態之監控畫面。
- 提供虛擬電門顯示，以監督學員座艙內操作之狀態是否正確。
- 一部標準工業型處理器。
- 四部19"色液晶顯示器。
- 彩色雷色印表機。
- 3D繪圖式儀錶顯示。
- 中英文操作與顯示。

輸出入界面分系統

- 工業標準19吋工業機箱、多插卡式背板。
- 提供離線輸出入界面狀態監控與偵錯。
- 每日開機測試。

視效系統

- 採用半徑3m、視角180° x 44° 之柱狀銀幕，以提昇虛擬實境視覺感。
- 三部高解析度DLP投影器。
- 系統影像解析度為1400點 X 1050條線。
- 本所自行開發之PC平台電腦影像產生器，採用開放式系統架構，以微軟公司Direct X API 為基礎所撰寫之電腦影像繪圖與管理程式，具有最先進的影像變形處理與多頻道影像接合平滑化功能，可以應用於平面銀幕、圓柱型銀幕與弧形銀幕之視效顯示；其視效料庫採用衛星照片或空照圖，以材質貼圖方式整合DTM數位高程資料可產生高解析度現地重現之動態視覺影像。
  ☆具白晝、夜晚、星辰、太陽的模式設定。
  ☆具備假影消除 (Anti-Aliasing) 功能。
  ☆具能見度改變及設定。
  ☆影像解析度：可達1400×1050條線以上。
  ☆影像更新頻率：至少60Hz 。
  ☆POLYGON容量：每channel可處理30,000個POLYGON（含以上）
- 全台視效資料庫採用高解析度(2.5m)衛星照片圖資。
- 機場部份採用50cm航照貼圖。

力感系統

- 一部標準工業型處理器。
- 二組數位電動力感致動器模擬駕駛桿力迴讀效應。
- 提供飛機失速抖動模擬。

Instructor /Operator Station

- It is responsible for the sub-system control.
- Provides flexible and user-friendly means for training management.
- Provides virtual control panels that synchronize with the physical control panel inside the cockpit.
- One industrial-grade PC.
- Four 19"Color LCD monitors.
- Color laser printer.
- 3D graphic instrument display.
- Chinese/English user interface.

I/O interface system

- One industrial-grade PC with 9 pieces of I/O control cards.
- Offline system diagnostic and trouble shooting.
- Daily readiness test.

Visual System

- A 3m radius cylindrical screen with 180° x 44° view angle used for enhance virtual reality.
- Three high resolution DLP projectors.
- The system resolution is 1400 x 1050 pixels.
- The PC-based Image Generator is developed by ASRD/CSIST. The real-time programming is based on the state-of-the-art Microsoft 3D Directx 9.0C. It provides Dynamic Distortion Correction for projection on to any kind of screen. It also incorporates Edge Blending for multiple projector application. It uses full color, high resolution Geo-specific Aerial Photography and Satellite Imagery, to produce high fidelity scenes.
  ☆Day/Dawn/Dusk/Night or continuous Time of Day operations.
  ☆With Anti-Aliasing function.
  ☆Adjustable visibility.
  ☆Resolution：Up to 1400 x 1050 pixels (@60Hz).
  ☆Update rate: ≧60Hz
  ☆30000+polygons per channel.
- The visual database covered entire Taiwan area, utili… high resolution (2.5m) satellite imagery to enhance the realistic vision.
- All the airports utilize the aerial photography which resolution is as high as 50cm.

Control Loading System

- One industrial-grade PC.
- Two sets of digital electrical control loading system providing force feedback on the control stick.
- Stick shaker for simulating the aircraft stall.