TH67 全功能飛行模擬機

Introduction

TH-67 Full Function Flight Simulator(FFS)

分系統功能簡介 *Description of Sub-system*

主計算機系統
採用SGI O300工作站等級之主計算機，可提供穩定的即時模擬環境；直昇機數學模式則採用ART FlightLab模擬程式，可精確的模擬TH-67直昇機之飛行動態。

投影系統
採用雙曲度之弧形螢幕，具有220度水平視角、70度垂直視角，採用Christine系列投影器，具有5 Foot-Lambert以上之亮度，五個頻道之投影可利用電腦調校方式，確保接處之平順與色彩之一致。

動感平台
採用FCS ECue 660-8000之六軸電動平台，正常操作之酬載重量為7500公斤，可提供偏航、滾轉、俯仰、上下、左右、及前後六自由度運動之動感法則。

乘員艙
乘員艙使用真實座艙結構，座艙之開關旋鈕均與真實飛機相同，儀錶顯示則採用電腦繪圖方式製作，可有效降低製作與維修成本，並依據訓練需求選取儀器飛行或目視飛行機型。教官監控台可透過座艙內裝設之攝影監視器觀察學員訓練狀況。

力感系統
採用FCS ECoL 8000力感控制系統，依據飛行員之飛行操作狀態提供力回饋感受，包括迴旋桿之俯仰與滾轉控制、集體桿之起降控制，腳舵板之方向控制則採用摩擦條之設計。

輸出入介面系統
採用Adlink之工業標準輸出入介面控制系統，擷取座艙及教官台之控制信號，透過信號調節、數位/類比之轉換、及資料格式轉換，再將資料透過反射式記憶體送至模擬主計算機，並依據計算結果驅動座艙及教官台相關的指示燈號

Host computer
The SGI O300 workstation computer provides a stable real-time environment for simulation. The mathematic model of helicopter dynamics is generated from ART FlightLab. It provides a precise simulation of the helicopter maneuvering.

Projection display system
The two-dimension curvature screen has 220° horizontal, 70° vertical view angle. The Christine projectors provide sharp visual scene more than 5 Foot-Lambert brightness. The blending effect between 5 projectors can be adjusted by computer to have a consistence scene.

Electrical motion platform
The FCS ECue 660-8000 is consist of six actuators driven by electrical motor. The payload of the system is more than 7500 Kg during normal operation. It provides realistically motion cues during helicopter maneuvering including Yaw, Roll, Pitch, Heave, Sway, Surge motion.

Cockpit system
The structure of TH-67 FFS' cockpit is part of the real Helicopter, the control switches and knobs are same as the real. But the instrument display are generated by computer graphic and mask. It will not only reduce the manufacture and maintenance cost, and the cockpit can be changed between IFR and VFR configuration according to the training requirement. The camera inside the cockpit can monitor the pilot training situation from operation control station.

Control loading system
FCS ECoL 8000 Control loading system provides realistically artificial feel of the flight control mechanics according to the flight condition. There are pitch and roll control channels on cyclic stick control and one channel on collective control. The force feedback of rudder pedal is generated by friction grip.

I/O interface system
The Adlink I/O interface system with industrial standard will acquire the signals from cockpit and operation station to do the manipulation, D/A conversion, format translation. The output signals will send to the host computer through the Reflective Memory Bus to drive the relative indicator in the cockpit .

音效系統
採用ASTi音效控制系統，可模擬飛行操作之各種音效：如引擎啓動、旋翼轉動、警告音響、摩斯碼聲音、座艙內通話及教官台間的通訊等功能。

視效產生器
採用Primary Image之視效產生器，根據直昇機之位置與姿態變化，計算視效資料庫中地形、地物之視覺變化，產生適切的視效場景，並透過投影器呈像在弧形銀幕上，使飛行員的視覺產生逼真的臨場感。

夜視鏡系統
採用nVision之模擬夜視鏡可提供逼真之夜視影像，影像訊號經由夜視處理器之調變，可產生雜訊、陰影、光暈等特殊效果。

教官監控台
教官台採用整合式機櫃的設計型式，可提供教官良好之操作環境。教官台所有操作畫面均以中文化及操作便利性為設計考量。

(1)系統操作設定畫面：包括操作課目選擇、模擬環境參數設定、初始狀態選擇、及錄製與重放操作，以提供訓練課目之選擇與設定、設定、與參數紀錄等功能。
(2)系統狀態顯示畫面：包括系統狀態顯示、飛行軌跡顯示、信號記錄等功能。並於訓練進行期間，提供動感平台位置、加速度、和系統狀態等操作資訊。
(3)儀錶顯示畫面：用以顯示座艙內配置的各類儀錶或指示器之狀態。
(4)視效影像顯示：同步顯示座艙內之視效影像畫面。

全功能訓練設施
- 模擬系統、訓練教室、廠區佈置設計及建構的套裝解決方案
- 室內、操作前後、任務講詢等全訓練程序設計
- 能源與水源等環保要求設計

Audio system
The ASTi Audio system provide the simulation sound effect during aircraft operation including engine starting, rotor blade rotation, warning tone, Morse code, internal communication, and communication between pilot and operator.

Image generator
The image generator will generate the visual image of terrain objects according to the aircraft position and attitude. It will provide realistic visual effect to the pilot through the projectors to display on the screen.

NVG system
The nVision simulated NVG will provide realistic night visual scene through the Post Video Processor (PVP). The image signal will provide the special effect of NVG including noise, shadow of light, Halo effect.

Operation control station
The integrated station is designed to provide a friendly operation environment. The graphic user interface is designed in Chinese language and with user convenience

(1) The system operation window includes the selection of training course, parameter of simulation environment, initial condition loading, and record/playback.
(2) The system status display window provides the display of system operating state, flight trajectory, signal recording. It also provides the monitoring data of motion platform.
(3) The instrument display window provides the replicate of the instrument inside the cockpit.
(4) The visual scene display provides the operation scenarios of the helicopter flight.

Full Function Training Facility
- Turnkey system including simulation system, classroom training, facility layout and design, and construction.
- Full training process including classroom training, pre-operation orientation, post-operation orientation, mission case studies, and in mission orientation and lecturing.
- Green building design for energy and water efficiency.

TH-67