



PC-21 Training System

GENERAL MEETING OF THE CENTRE OF ADVANCED TECHNOLOGIES
AERONET "AVIATION VALLEY"
28-29 JUNE 2010, RZESZOW UNIVERSITY OF TECHNOLOGY

The background of the slide is a high-angle aerial photograph of a mountainous landscape. A river winds through a valley, and a town with several buildings is visible on the left. The foreground shows the dark interior of a cockpit, including the top of the seat and the edges of the instrument panel, suggesting the viewer's perspective is from the pilot's seat.

SCOPE

- Pilatus Aircraft Ltd
- Products & Customers
- PC-21 Integrated Training System
- Summary

PILATUS AIRCRAFT LTD, STANS



HISTORY

1944: SB-2 „Pelican“ (prototype)



1945: P-2 Training aircraft



1948: P-4 Multipurpose aircraft



1953: P-3 Training aircraft



HISTORY

1959: Piston Porter Yeti



1972: B-4 Glider



1975: PC-7 Training aircraft



PILATUS GROUP



Pilatus Aircraft Ltd, Stans

- Development
- Production
- Worldwide sales
- Maintenance
- Service

for Pilatus aircraft



Altenrhein Aviation Ltd, Altenrhein

- Maintenance
- Modernisation
- Overhauls

for Pilatus aircraft and others

PILATUS GROUP



Pilatus Business Aircraft, Ltd., USA

- Sales
- Completions
- Service

for PC-12 aircraft in America

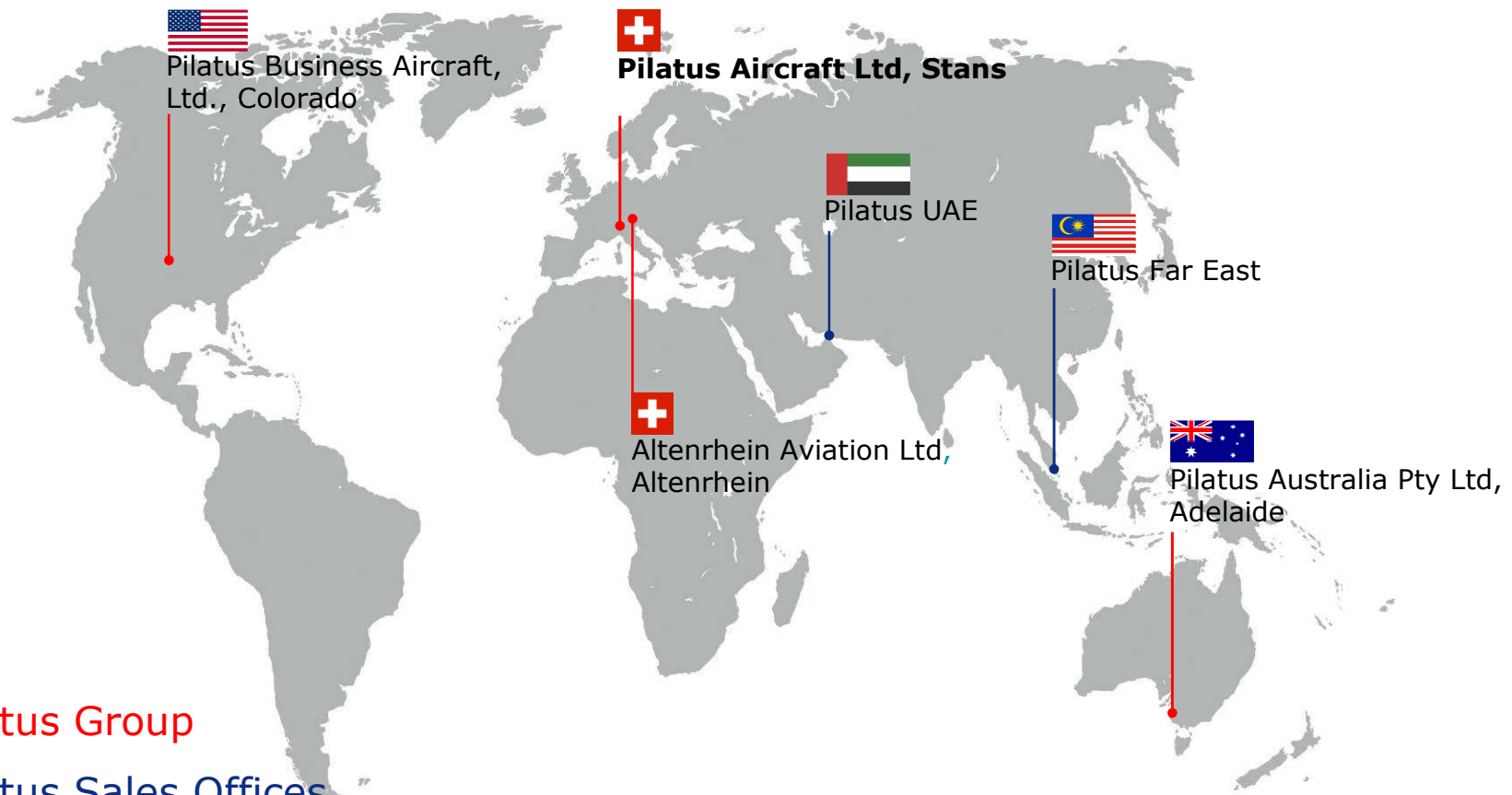


Pilatus Australia Pty Ltd, Adelaide

- Sales
- Marketing
- Service

for PC-12 aircraft

AN INTERNATIONAL COMPANY



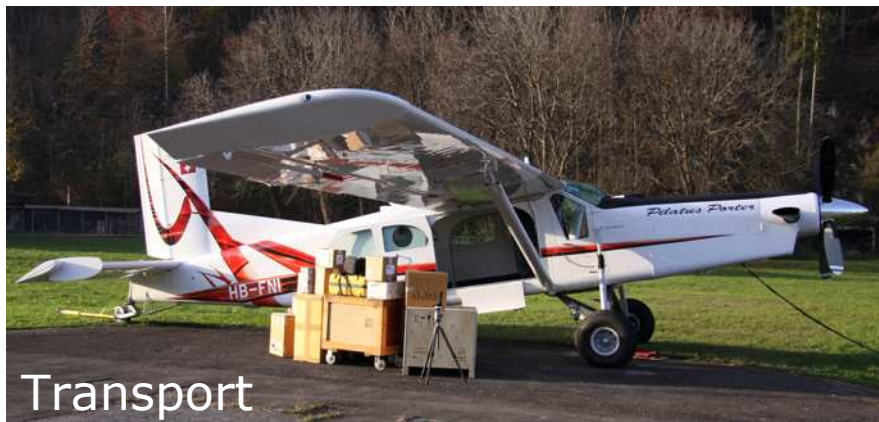
- **Pilatus Group**
- **Pilatus Sales Offices**

TRANSPORT & SPECIAL MISSION AIRCRAFT



PC-6 Turbo Porter

APPLICATIONS: PC-6



Transport



Ambulance / MedEvac



Parachuting



Surveillance

CUSTOMERS PC-6

- The PC-6 has been produced and sold with success since 1959
- Delivered to air forces, non-profit organisations, parachute centres, transport companies and a variety of private customers



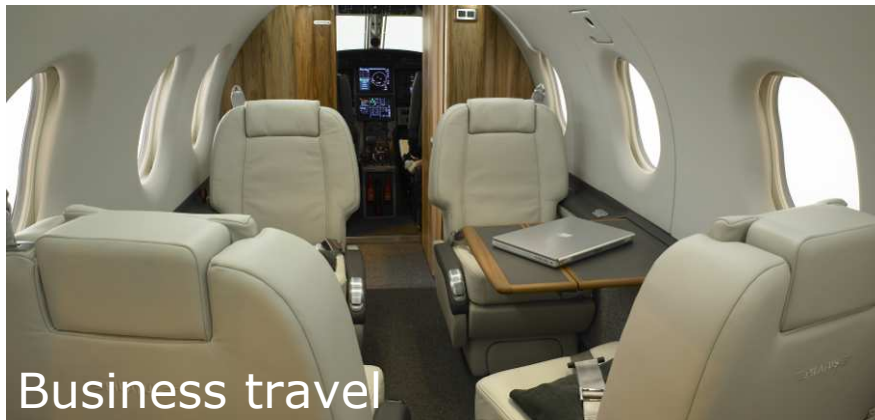
- Swiss Air Force
- Austrian Air Force
- South African Police Services
- Yeti Airlines, Nepal
- JAARS, Indonesia
- Susi Air, Indonesia
- ParaCentro, Locarno
- Zimex Aviation Group, Zurich

TRANSPORT & SPECIAL MISSION AIRCRAFT



PC-12 NG

APPLICATIONS: PC-12 NG



CUSTOMERS PC-12 / PC-12 NG

- In operation in 34 countries since 1994 (65% of annual production goes to North America, 25% to Europe)
- Delivered to the police, air forces, non-profit organisations, transport companies and many private customers



- Finnish Air Forces
- Western Australia Police
- Canadian Mounted Police
- Royal Flying Doctor Service of Australia
- Lions Air, Switzerland etc.

TRAINING AIRCRAFT

PILATUS

- Ab Intio Flying Training
- Basic Flying Training



PC-7 MkII

CUSTOMERS PC-7 / PC-7 MkII

Over 500 aircraft delivered to 21 air forces, including:



Switzerland



Botswana



Brunei



Chile



France



Holland



Malaysia



Mexico



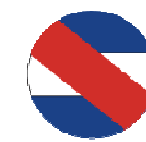
Austria



South Africa



UAE



Uruguay

TRAINING AIRCRAFT



- Basic Flying Training
- Advanced Flying Training



PC-9 M

CUSTOMERS PC-9 / PC-9 M

Over 260 aircraft delivered to 15 air forces, including:



Bulgaria



Angola



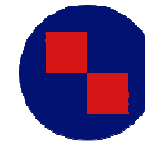
Australia



Switzerland



Ireland



Croatia



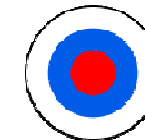
Mexico



Oman



Saudi Arabia



Slovenia



Thailand



Cyprus

TRAINING AIRCRAFT



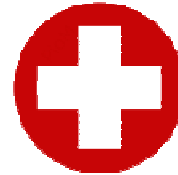
- Basic Flying Training
- Advanced Flying Training
 - ↳ Full Mission Management Training
 - ↳ Embedded Simulation and Emulation



PC-21

CUSTOMERS PC-21

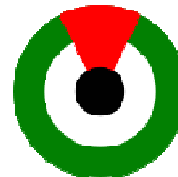
50 aircraft sold to three air forces.



Switzerland



Singapore



UAE

PC-21 TRAINING SYSTEM



PROGRAMME SCHEDULE

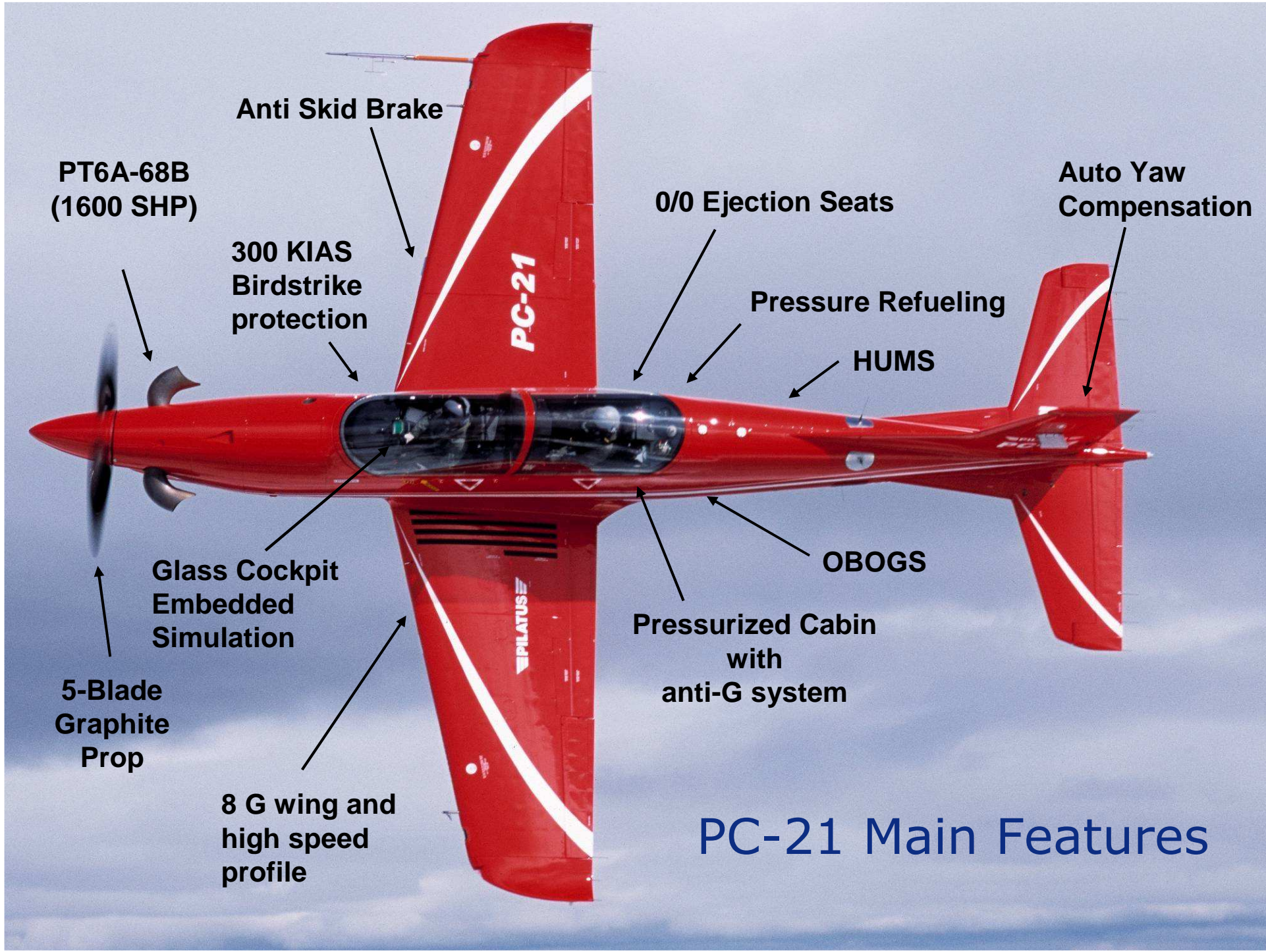
- First flight Prototype → July 2002
- VFR certification → Dec 2004
- First Series Aircraft → Aug 2005
- IFR certification → Dec 2006
- Currently 27 Series A/C → Pilatus (2)
SwiAF (6)
RSAF (19)



- ▶ Maintain Basic Trainer Qualities (PC-7 MkII, PC-9M)
- ▶ Retain Maintainability and Affordability of Turbo-Prop platform
- ▶ Increase Performance (Aerodynamic)
- ▶ Increase Capabilities (Avionics and ES&T)
- ▶ Improve Teaching Environment
- ▶ Enhance Ergonomics / Human-Machine Interface
- ▶ Increase Flexibility for the Operator
- ▶ Increase Turbo-Prop Footprint for Pilot Training

Reduction of the overall Cost





**PT6A-68B
(1600 SHP)**

Anti Skid Brake

0/0 Ejection Seats

**Auto Yaw
Compensation**

**300 KIAS
Birdstrike
protection**

Pressure Refueling

HUMS

**Glass Cockpit
Embedded
Simulation**

OBOGS

**5-Blade
Graphite
Prop**

**Pressurized Cabin
with
anti-G system**

**8 G wing and
high speed
profile**

PC-21 Main Features

PC-21 PERFORMANCE



Design Dive Speed	420 KIAS 780 Km/h
Max Operating Speed	370 KIAS 685 Km/h / M 0.72
Max Level Speed @FL100 ISA	337 KTAS 625 Km/h
Max Low Altitude	323 KTAS 600 Km/h
Stall Speed Gear/Flap	81 KTAS 150 Km/h
MAX ROC Sea Level ISA	> 4000 fpm >20 m/s
Max / Min G	+ 8.0g / - 4.0g
Max Take-off Weight	3100 kg
Roll rates above 250 KIAS	200 °/sec
Endurance (Hi Level)	2.5 Hrs

Fatigue Life

- The PC-21 is a **damage tolerant airplane** with a service life of **15'000 flight hours** based on the FALSTAFF Design Spectrum.
- **45,000 Simulated Flight Hours (3 lifes)** completed with a full scale test article.

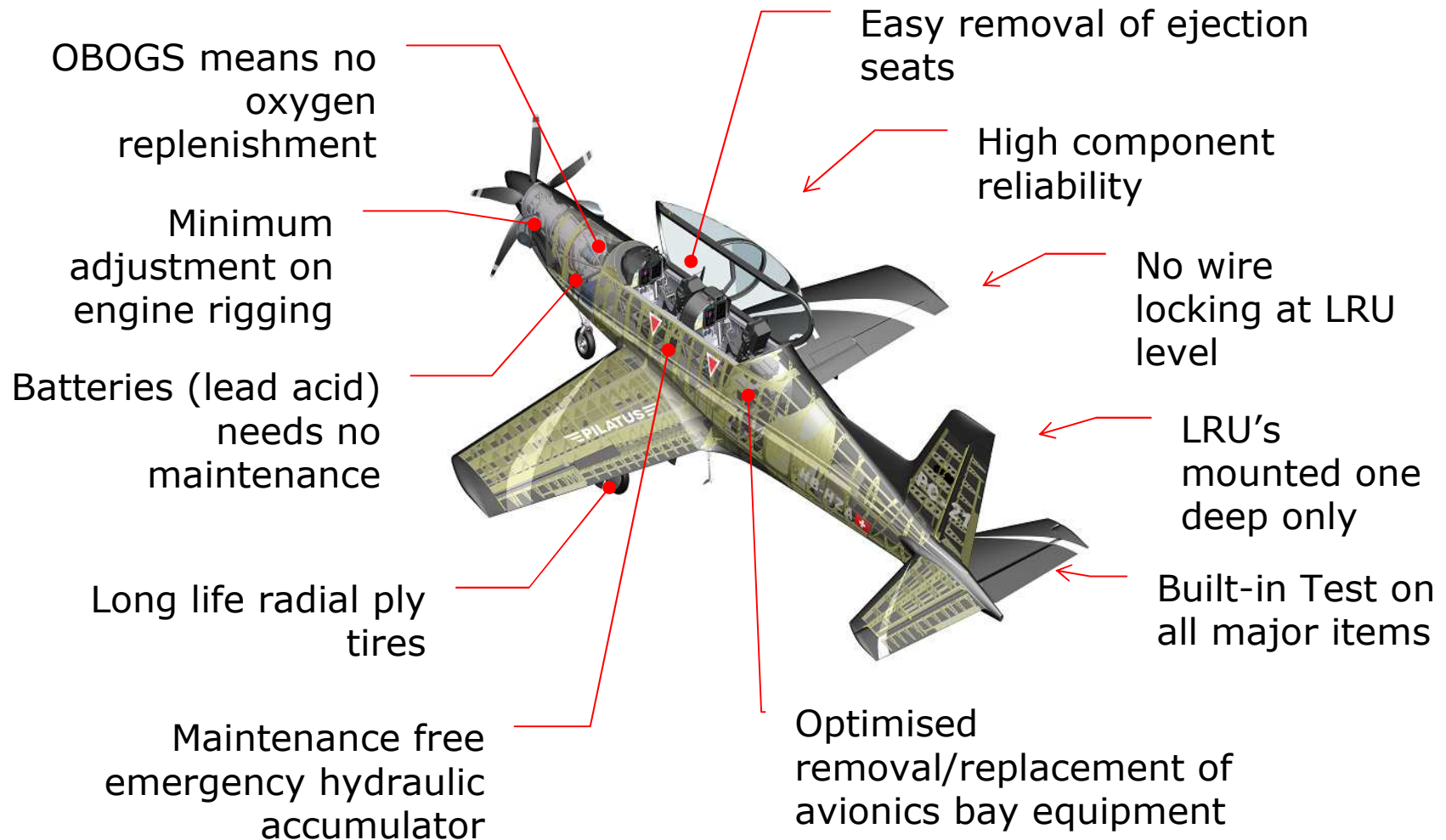


Mk-CH16C Ejection Seat



- Zero/Zero (0/0)
- 0 to 40,000 feet/ 0 to 400 KIAS
- Interseat Sequencing system
- Height adjustable
- Customisable PSP

PC-21 Supportability Features (LRU)



PC-21 Supportability Features (System)

Dimensional accuracy allows interchange of doors and panels
(a result of the CAD/CAM design- & production environment)

Advanced support
equipment package
(incl. Integrated
Electronic Technical
Publications)

Fast A/C turnaround time
12 minutes; one mechanic



Health and Usage
Monitoring System

Large service panels (bottom
plus side entry doors to
avionics bay)

Minimal scheduled maintenance
Only 150/300 Hrs, no A/C depot tasks



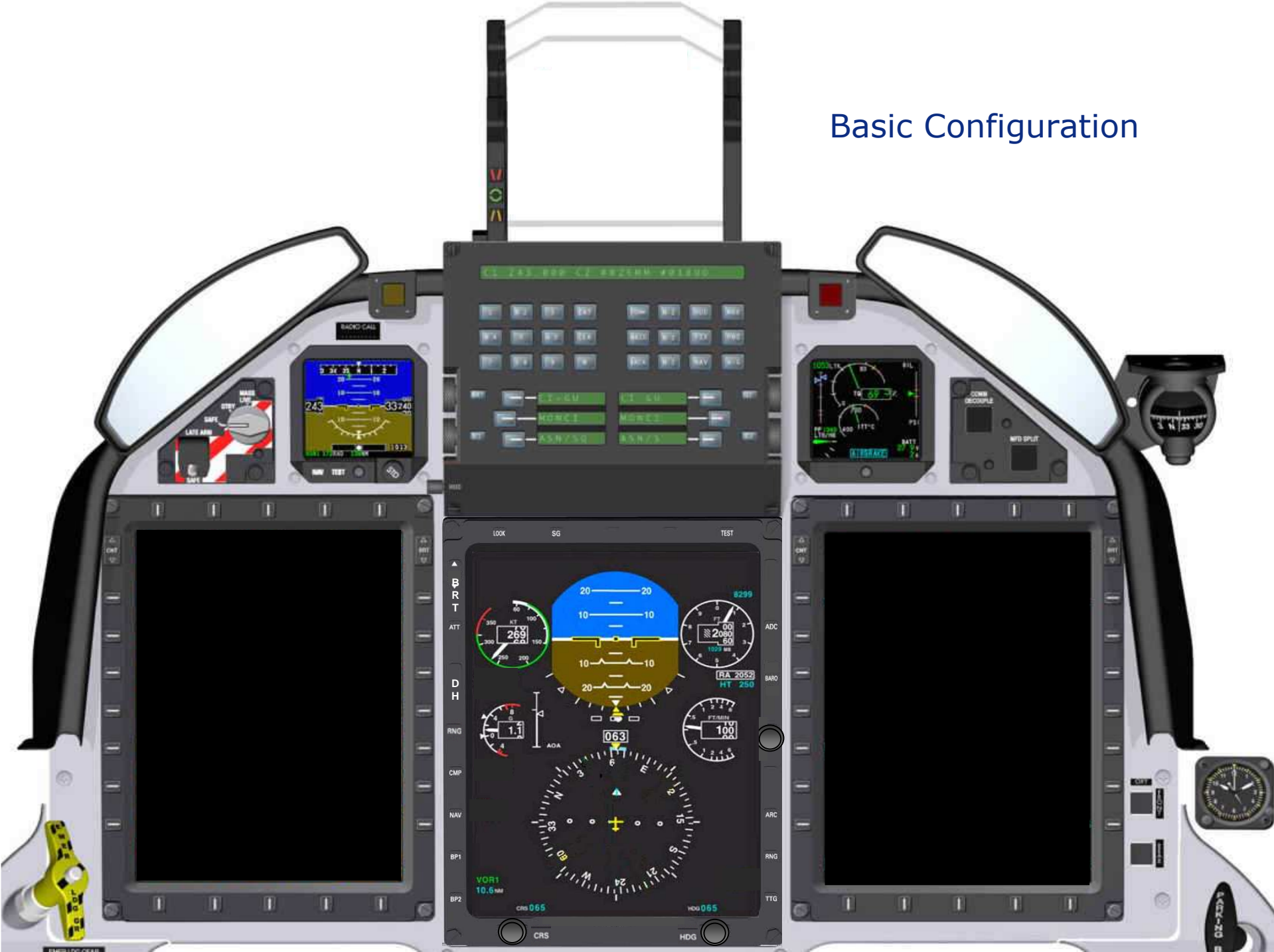


Cockpit

PC-21 COCKPIT & AVIONICS SUITE



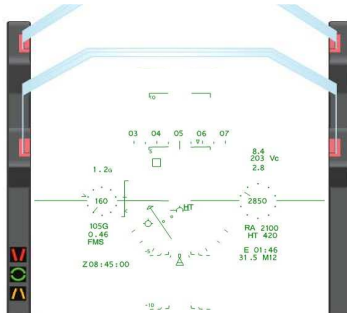
Basic Configuration



Electronic Checklist



HUD



Central control panel with a numeric keypad and function buttons. Labels include: C1 #01 BUO C2 #02 EMM #03 APP, 1-0, ENT, COMM, N 2, HUD, MKK, W 4, 5, E 6, CLR, RAD, N 2, FIX, POT, 7, 8, 9, 0, BACK, N 2, NAV, A-G, WRT, C1+GU, C2, REC, MON C1, MON C2, ASN/SO, GUARD, KCK.



Left display showing checklist and engine status: HYD, ELEC, FUEL, ECS, ENG. FIRE CHECKLIST v2.1, ENGINE BAY FIRE, ON GROUND?, IN THE AIR?, NORMAL EMERGENCY WARNING CAUTION ADVISORY.



Right display showing engine and fuel status: HYD, ELEC, FUEL, ECS, ENG. FF 370 KC/HR, COMM TO 88.3%, ITT 760°C, OIL, NP 1998 RPM.

Emergency and alert controls: EMER LOG OR PUSH BUTTON AND PULL, ALERT CANCEL, UNLOCK.

Mode control panel: HDG, ROLL, NAV, LOC, 1/2, ALT, PITCH, VS, HDG, NAV, ALT, VS, APR, GB, BC, RAIL, SOFT, V, IAD, APR, BC, IAS.

Stick controller with pedal adjust button.

Right-side control panel: PARK BRAKE, FUEL, FMS, GEN, GEN, FUEL, HYD, GEN, GEN, CHIP, SKID, ICE, CRIP.

Navigation



Moving Map



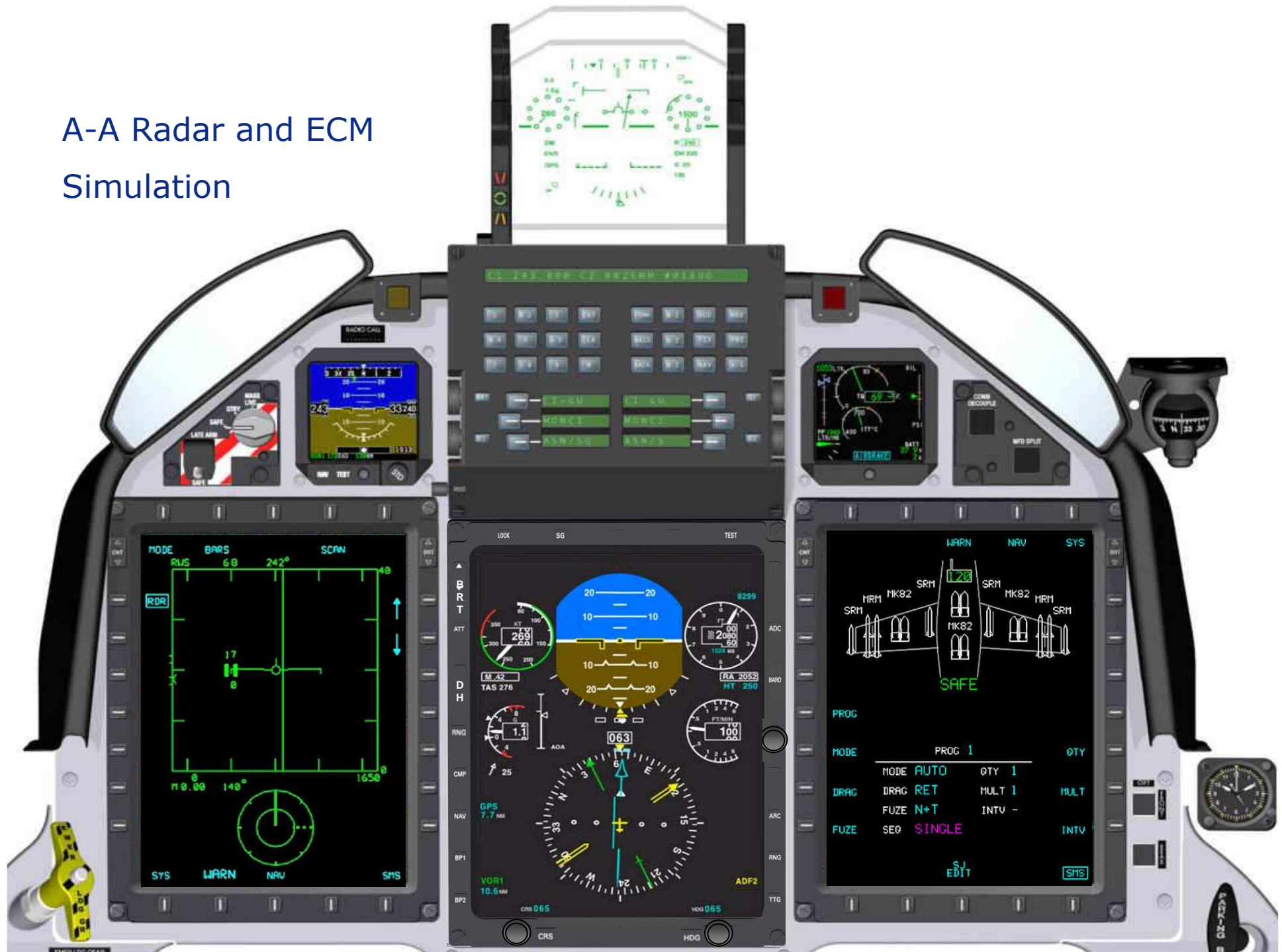
Tactical Routing



Stores Management



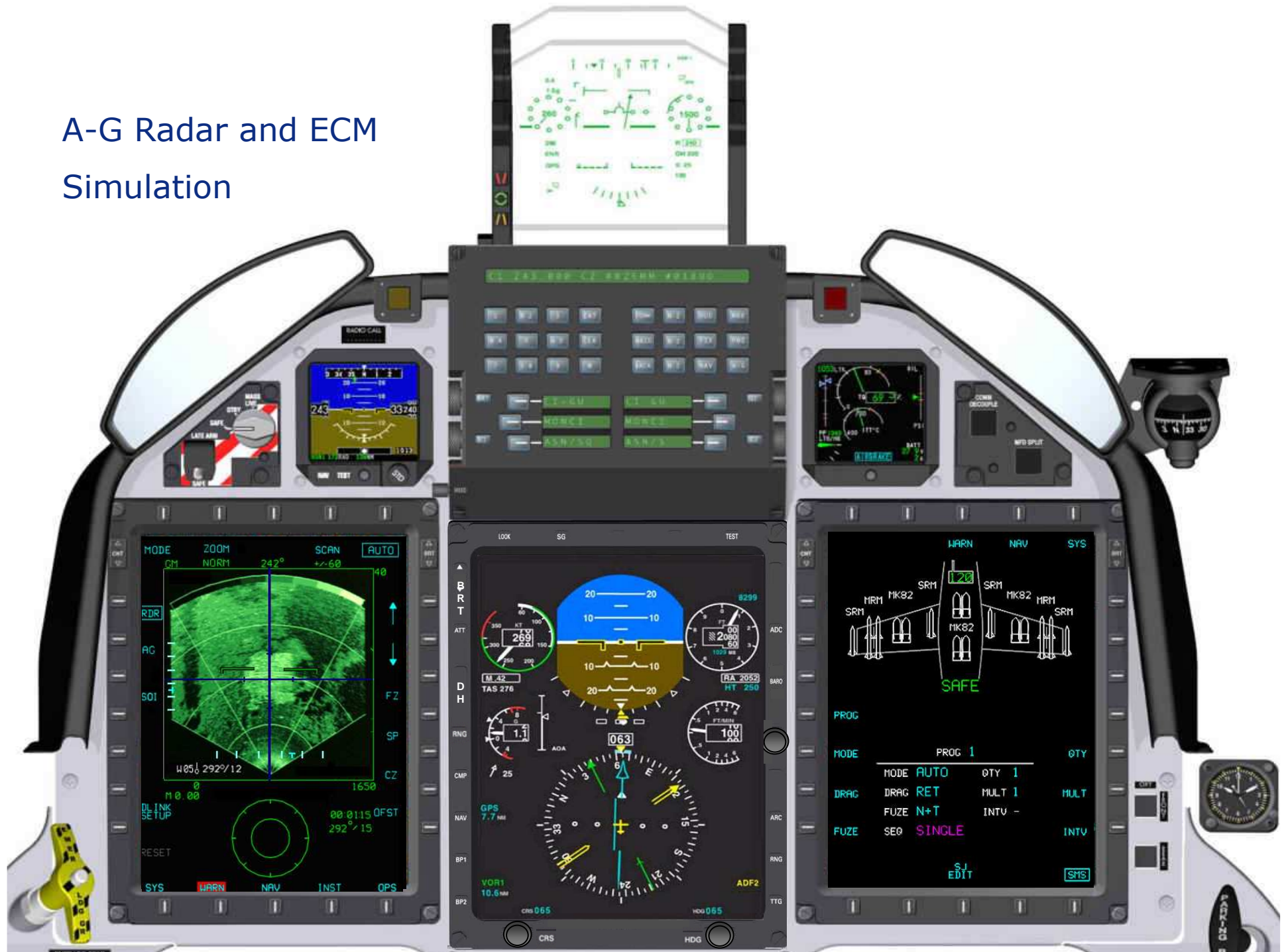
A-A Radar and ECM Simulation



Radar Target Simulation through Data Link



A-G Radar and ECM Simulation



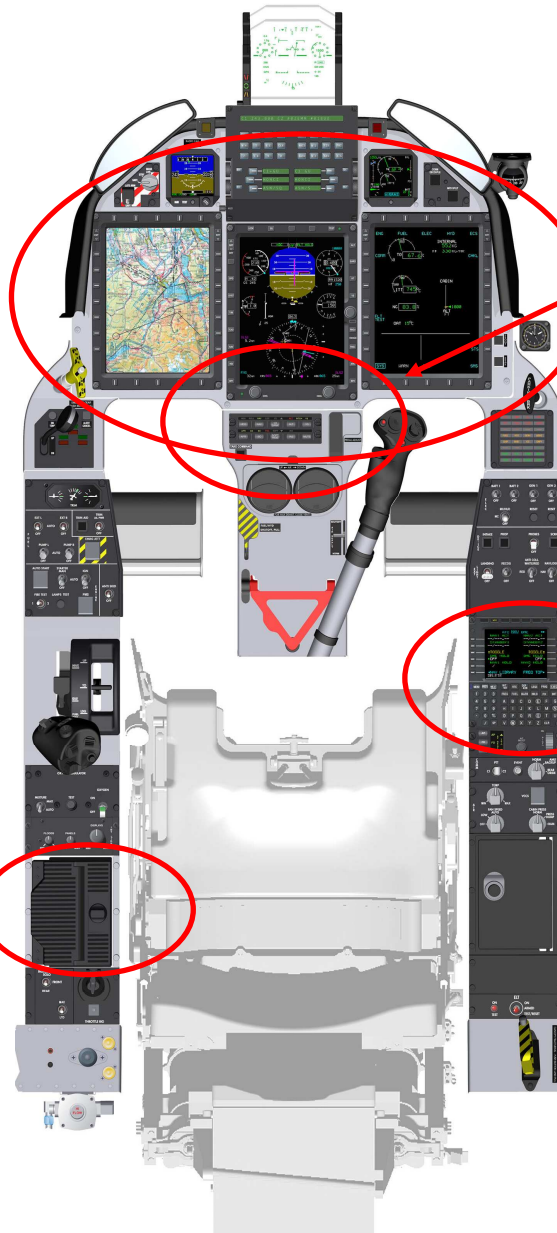
PFD + MFDs

- 6 x 8 inch
15 x 20 cm
- Active-matrix liquid crystal
- NVG-compatible

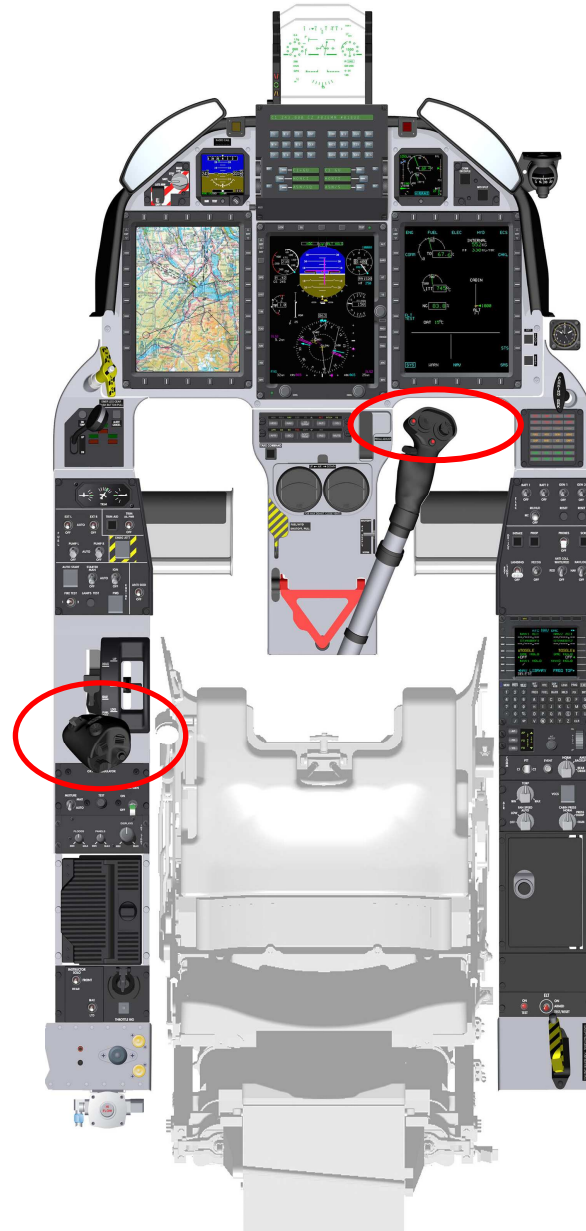
Autopilot

FMS

MDR

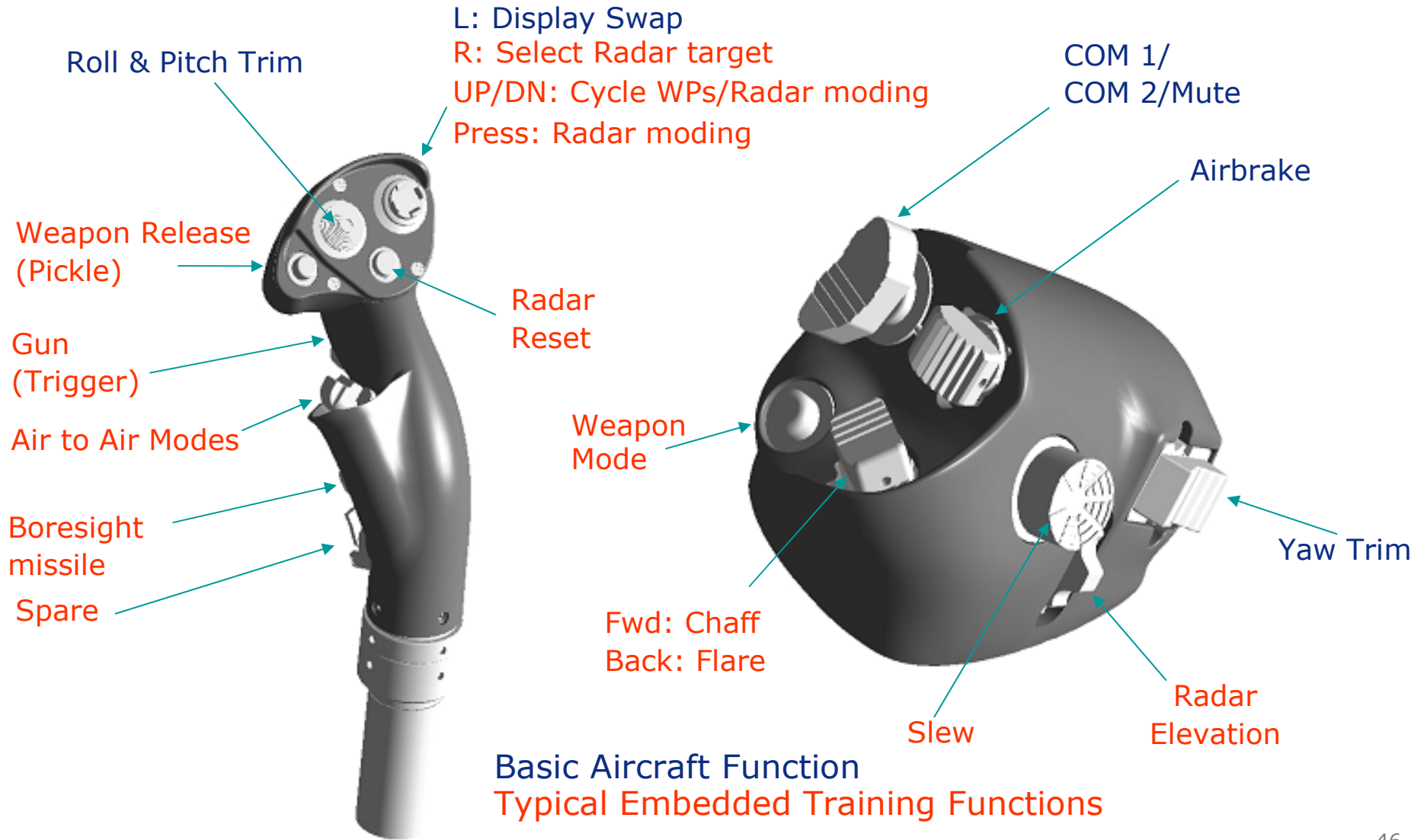


Customised HOTAS

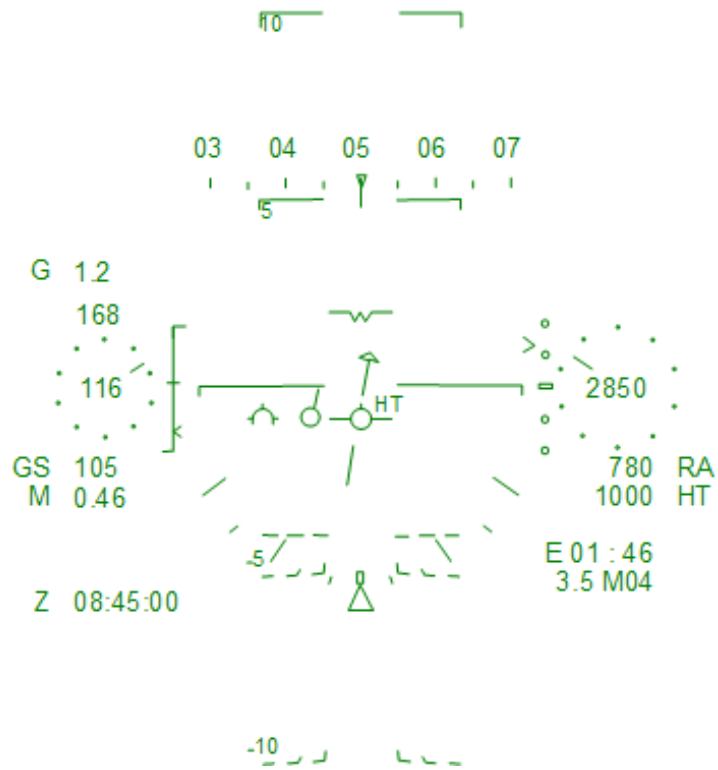


- F-16
- F/A-18 etc.

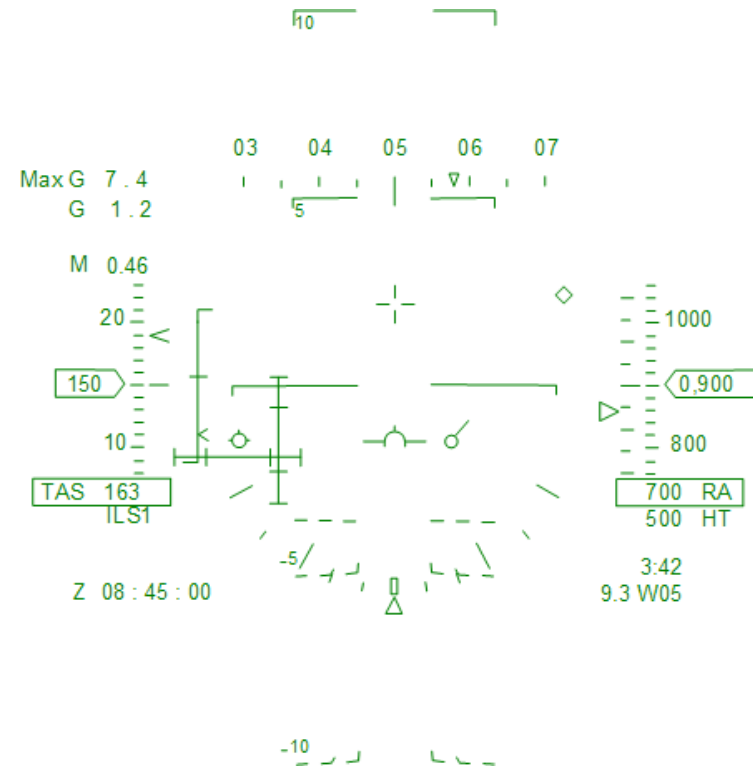
Customised HOTAS



Customised HUD



F/A-18 Style Configuration



F-16 Style Configuration

Cockpit Analogy



JAS39 GRIPEN



PC-21

Cockpit Analogy



EUROFIGHTER



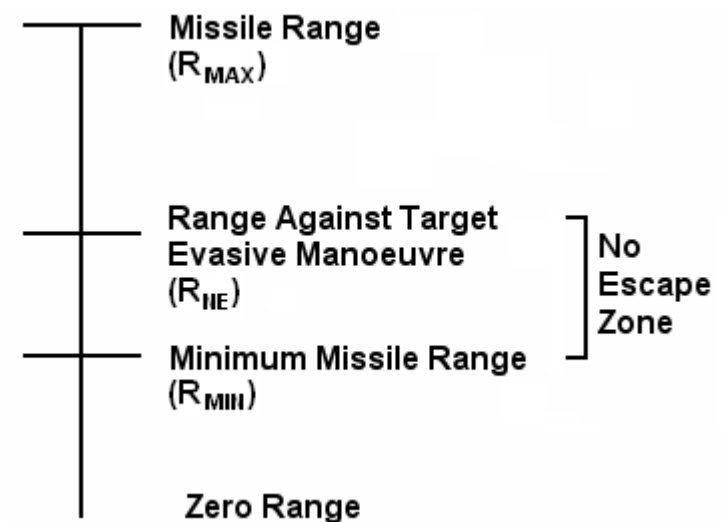
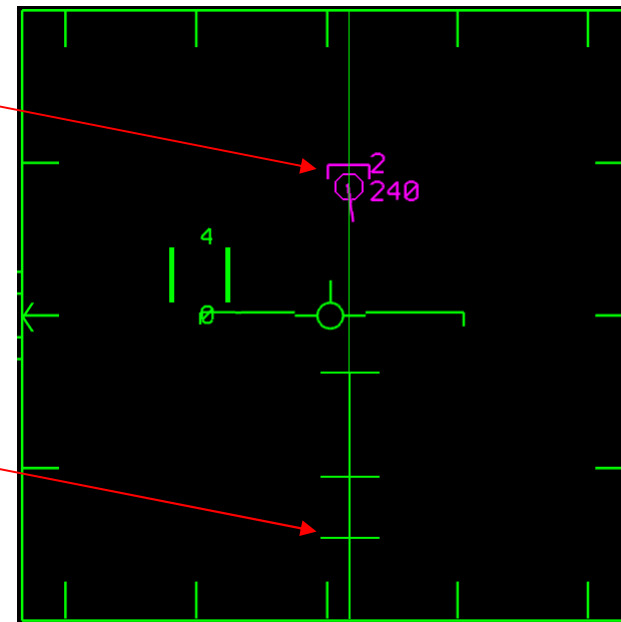
PC-21

Air-to-Air Training

- Modes:
 - Missile modes
 - Generic Short Range IR Guided Passive (SRM)
 - Generic Medium Range Radar Guided Active (MRM)
 - Gun modes
 - Lead Computed Optical Sight (LCOS)
 - Continuously Computed Optical Sight (CCIL)
 - Air to Air Radar with Datalink

Simulated Radar Contact

LSZ

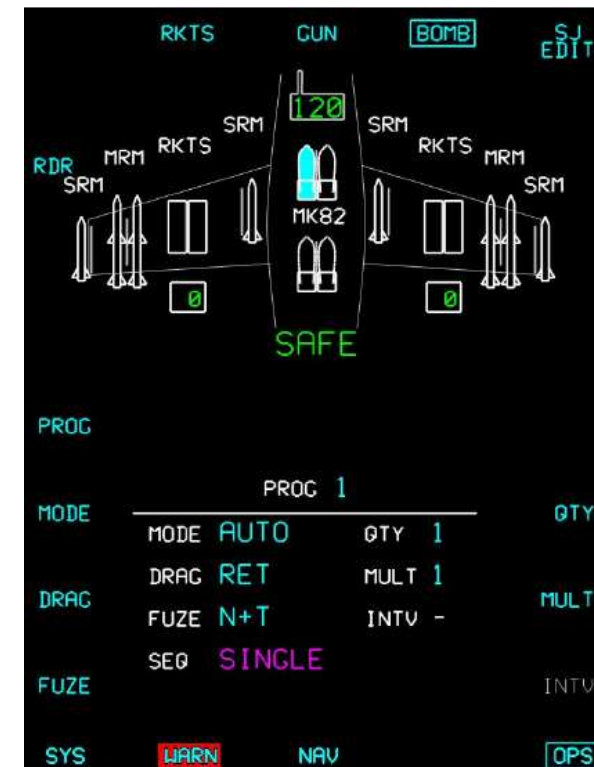
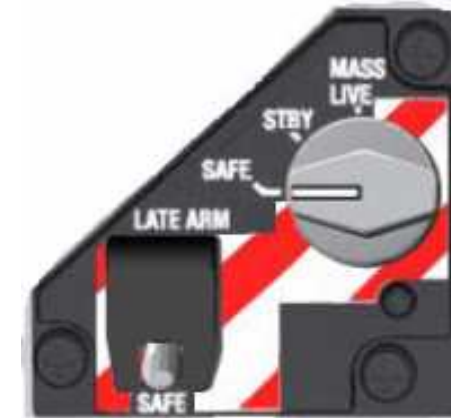


PC-21 HUD - Air to Air Training



Air to Ground Training

- Modes:
 - Pre-designated ground targets
 - Continuously Computed Release Point (CCRP)
 - Continuously Computed Impact Point (CCIP) Bombs
 - No pre-designated ground target
 - Dive Toss (DTOS)
 - Continuously Computed Impact Point (CCIP) Rockets (RCKT)
 - Air to Ground Radar



Synthetic A/G Radar

- GM Mode 10 nm Range
- EXP Mode 10 nm Range
- DBS 1 10 nm Range
- Freeze, Cursor Slew, Unfreeze
- DBS 2 10 nm Range
- Freeze, Cursor Slew, Unfreeze
- DBS 2 20 nm Range
- DBS 2 40 nm Range



PC-21 Embedded Training Capabilities

- ▶ Customisation of **MFD Pages**
- ▶ **HOTAS functionality** and **HUD** to resemble the end user platform
- ▶ Customised Synthetic **A/A Radar** with **on-board target generation** and **Real Time Datalink** for A/A embedded simulation
- ▶ Customised Synthetic **A/G Radar**
- ▶ Weapons training A/G + A/A including **Stores Management**

PC-21 Embedded Training Capabilities (cont.)

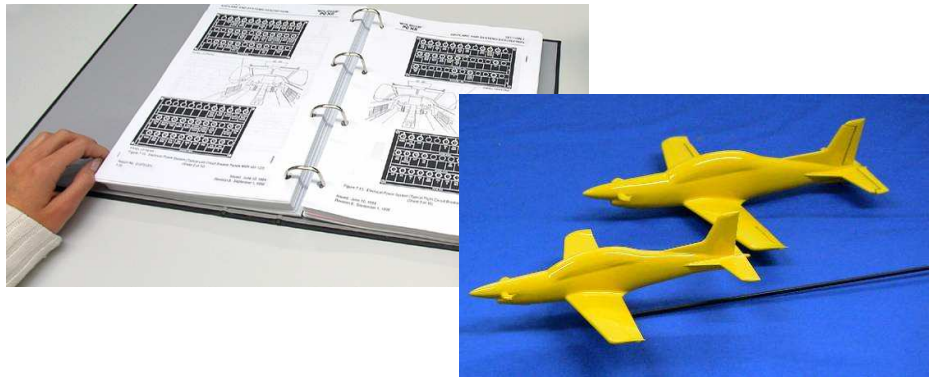
- ▶ Synthetic RWR
- ▶ Mission Data Recorder (MDR) → Video, Audio, Mission Data
- ▶ Split Cockpit Configuration
- ▶ Simulated Systems Failure / Data Degradation

Ground Based Training Systems

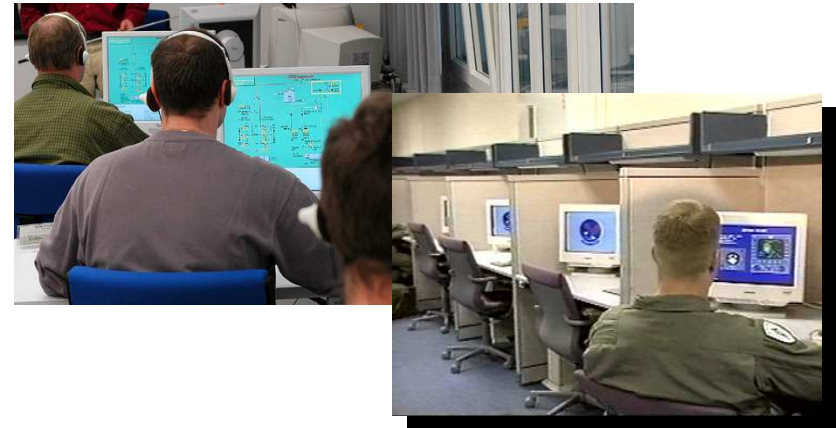


GROUND BASED TRAINING

▶ Training Documents & -Aids



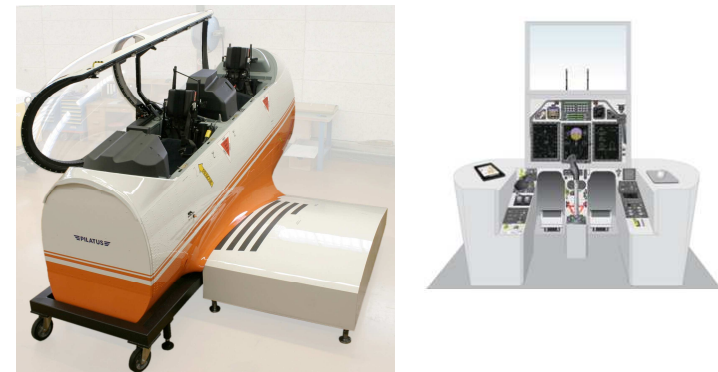
▶ Computer Based Training



▶ Personnel Training



▶ Synthetic Training Devices



FTD - Simulator

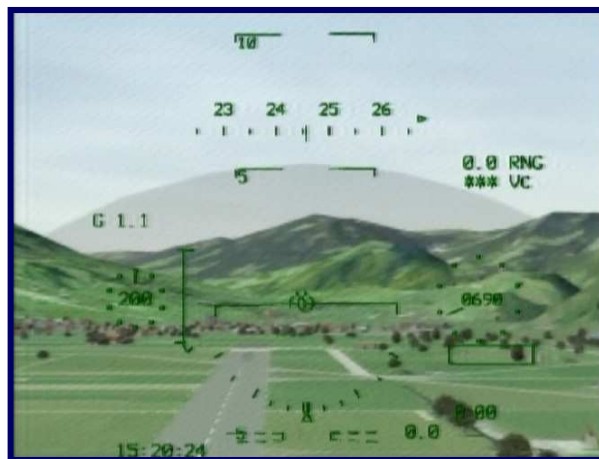


FTD - Simulator



Simulator qualification standards

- Performance / qualification in accordance with:
 - JAR STD-3A FNPT2 and JAR STD-2A Level 2 FTD
 - FAR AC 120-45A Level 6/7
 - JAR STD 1A / FAR AC120-40B ⇨ where applicable



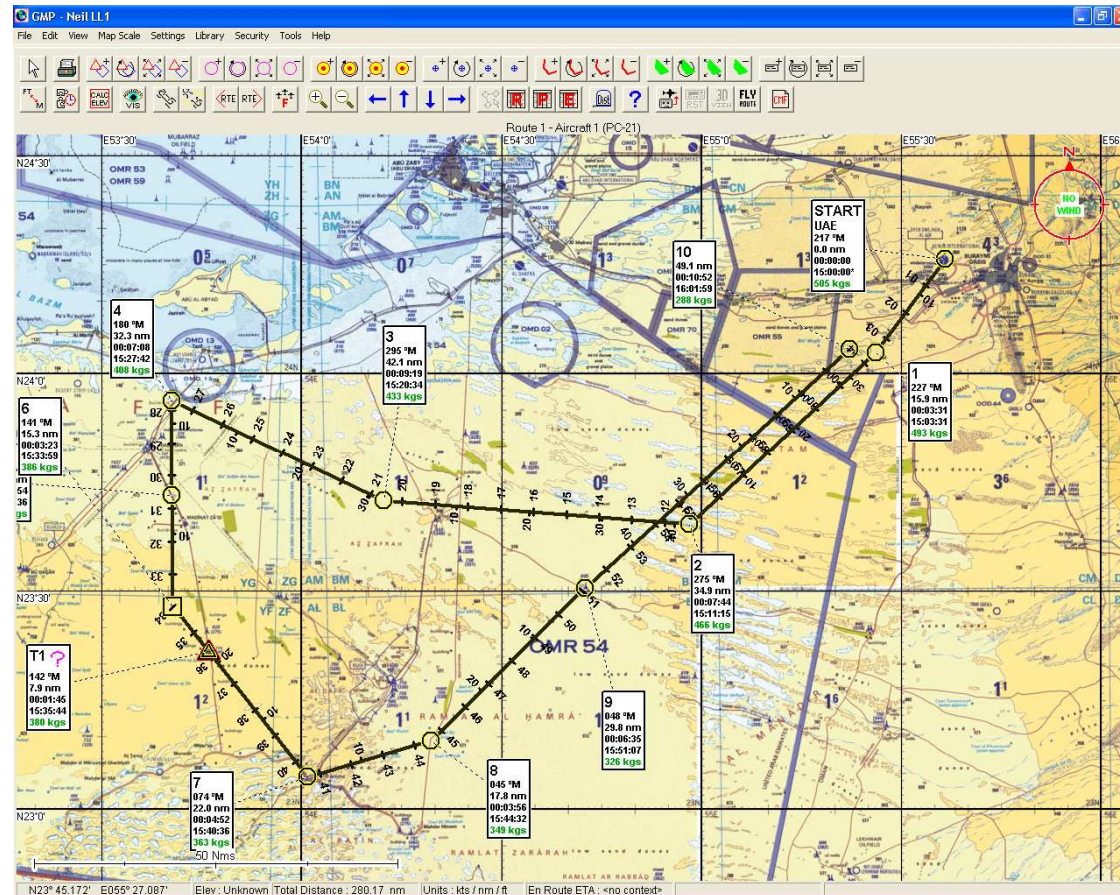
Mission Planning System (MPS)



Mission Planning System (MPS)



- Route planning
 - Fully interactive navigation
 - Targets
 - Formation, Tactical planning
- Performance database
 - Weight/balance
 - Crosswind
 - Take-off/land
 - Climb/descend
- System interface
 - Comms
 - A-A/A-G
 - Datalink
 - EW, Weapons



Mission Planning System (MPS)



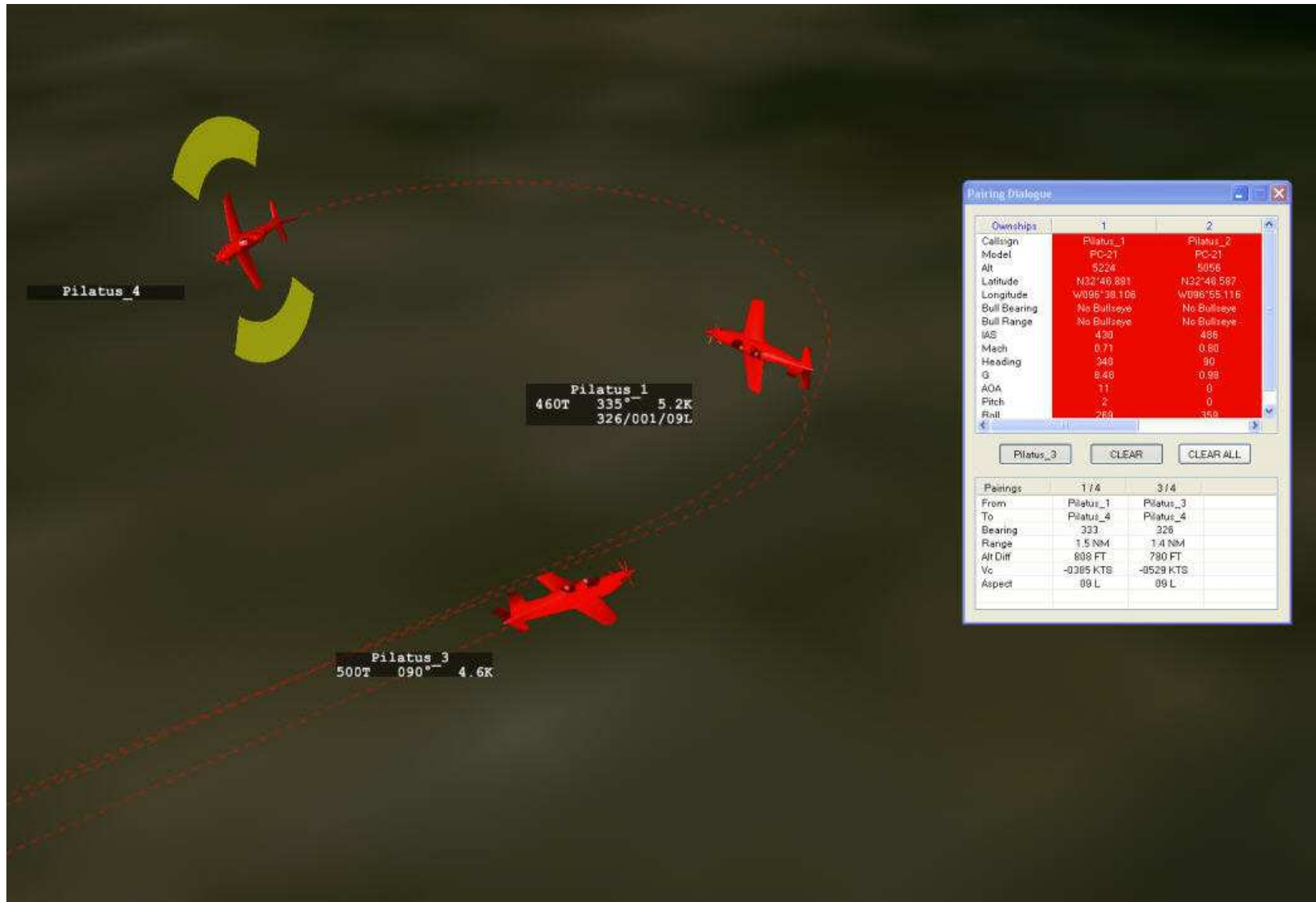
Mission De-Briefing System (MDS)



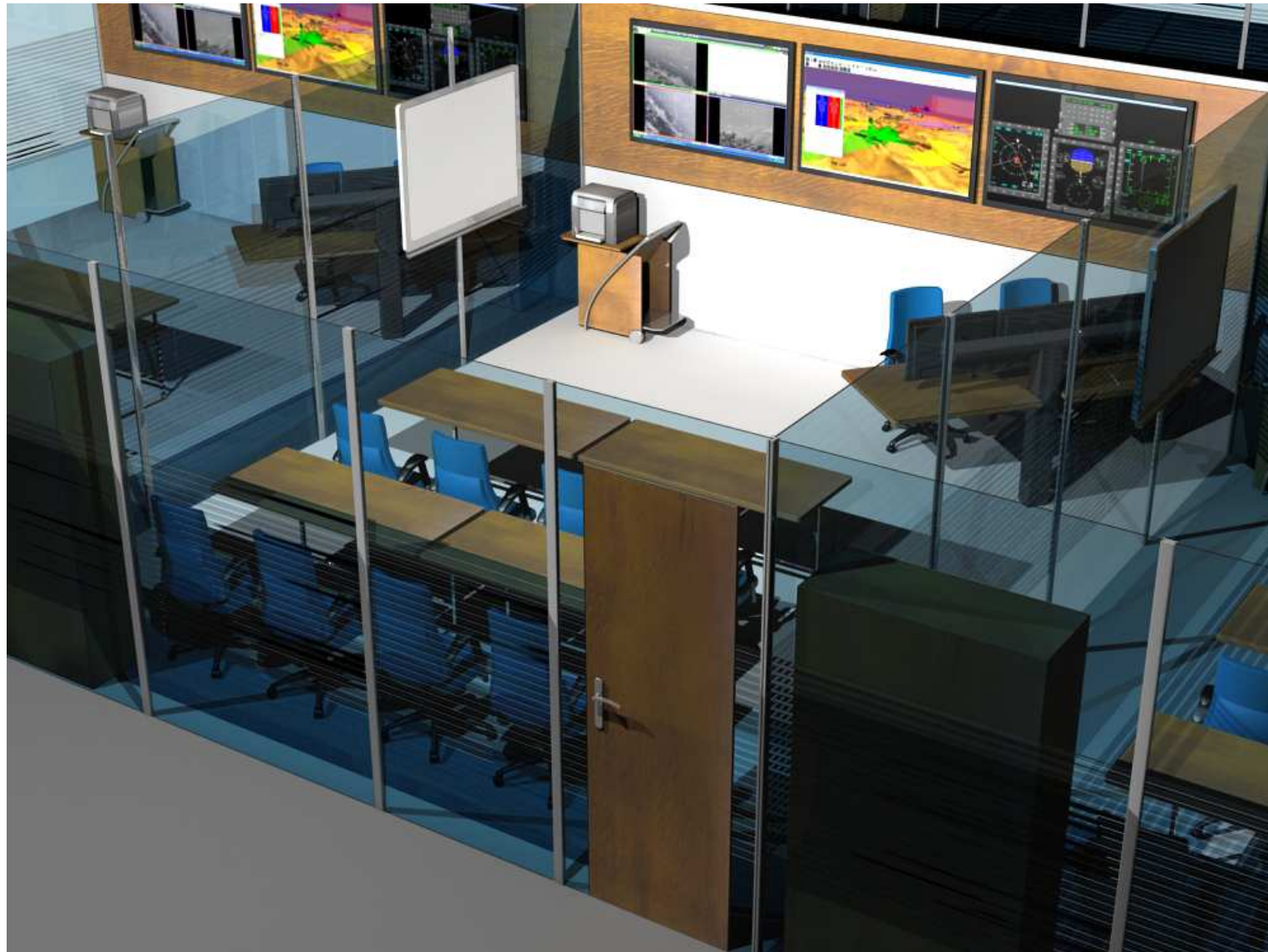
- HUD video
 - Outside world with HUD symbology overlay and audio communications
- External 3D View
 - Map view of up to four PC-21 aircraft
- CIF
 - Interactive cockpit (PFD, MFD)



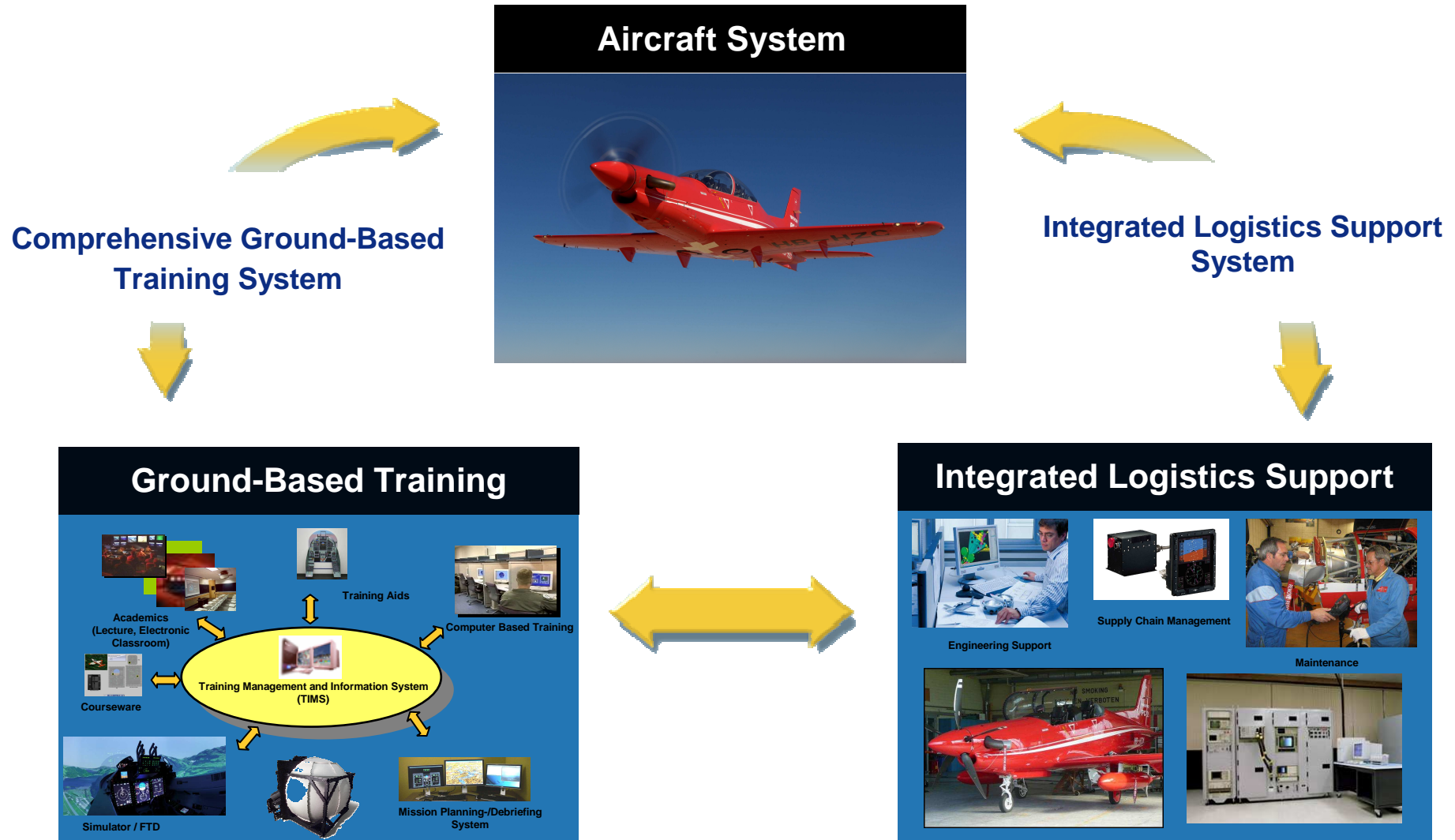
Mission De-Briefing System (MDS)



Mission De-Briefing System (MDS)



PC-21 TRAINING SYSTEM



PC-21 TRAINING SYSTEM



Theory



Computer-aided
Training



Simulator



Training in Aircraft



Transition to
fighter jet

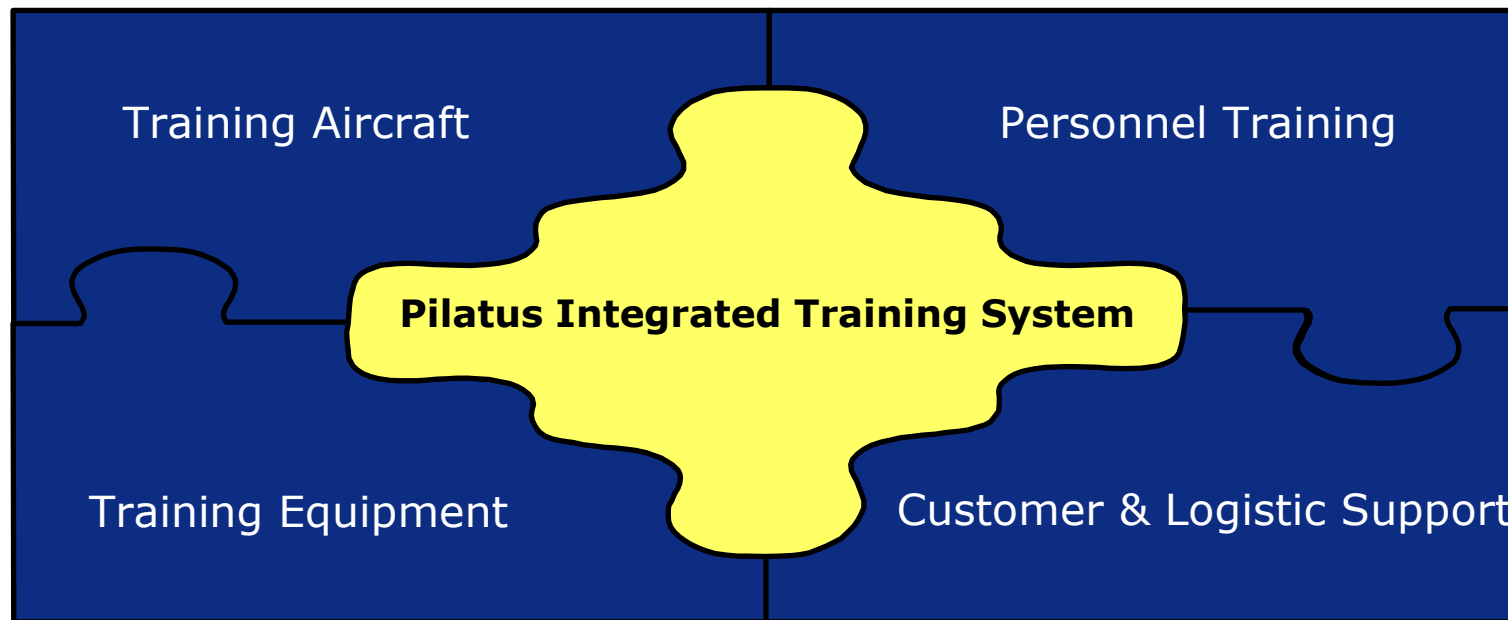


Transfer of Know-How

- ▶ From Aircraft Manufacturer to System Supplier
- ▶ Fully integrated Training Systems
- ▶ “Performance Based Contracting” Training Solutions

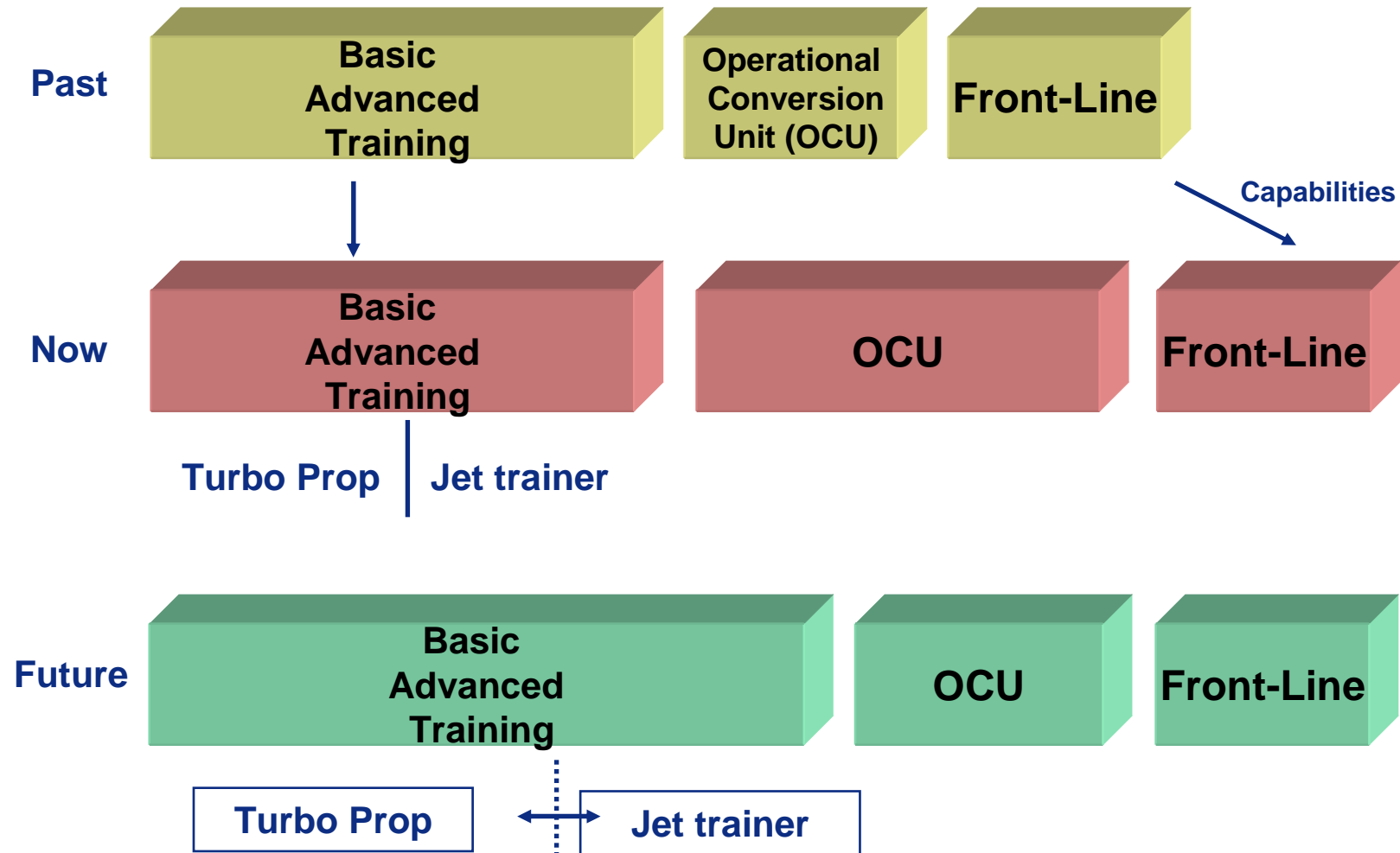
BENEFITS FOR THE CUSTOMER

The Pilatus Training System ensures full integration and high training and cost effectiveness

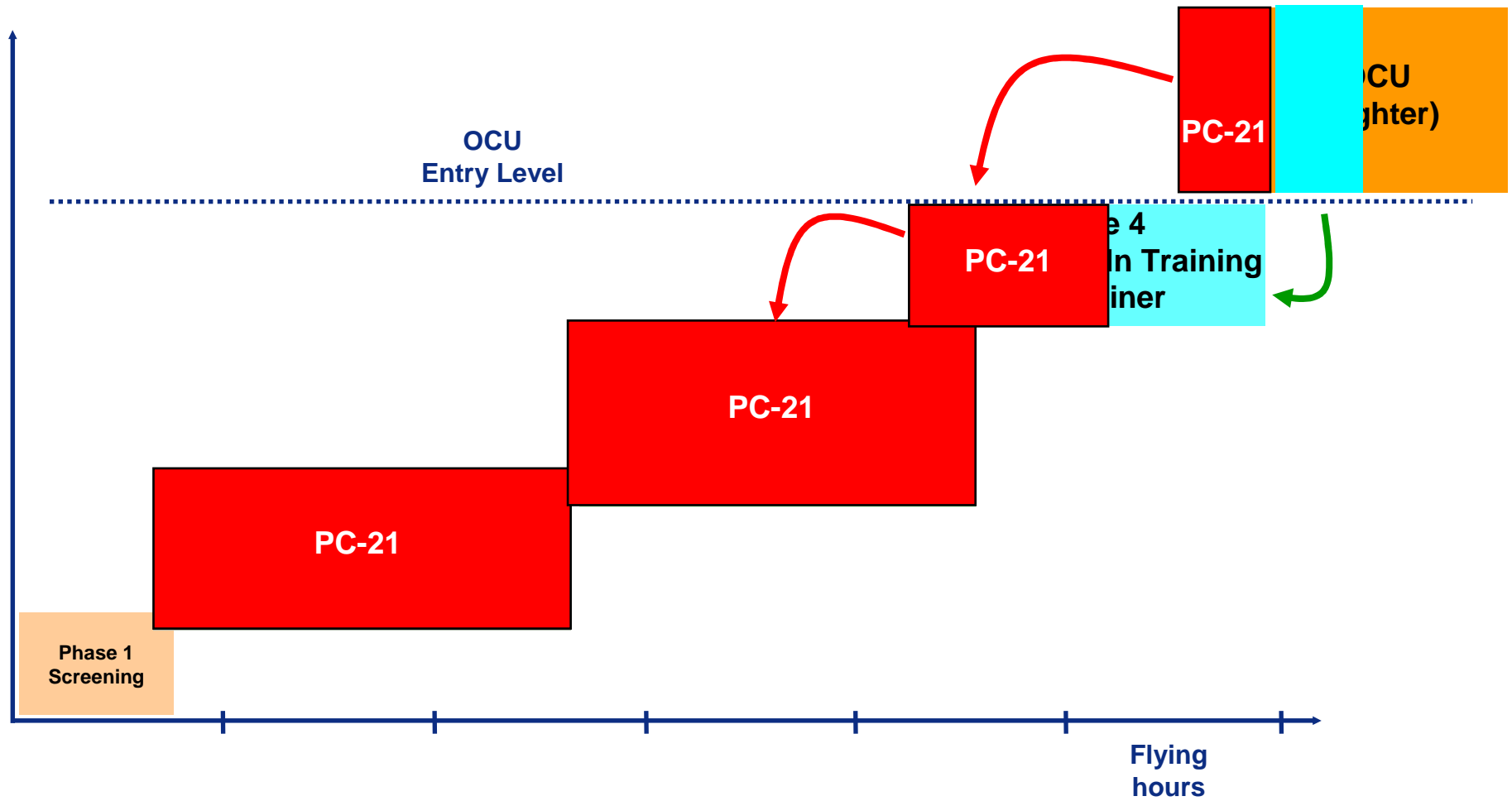


Pilatus as the OEM guarantees an integrated system and long term continuous maintenance and support

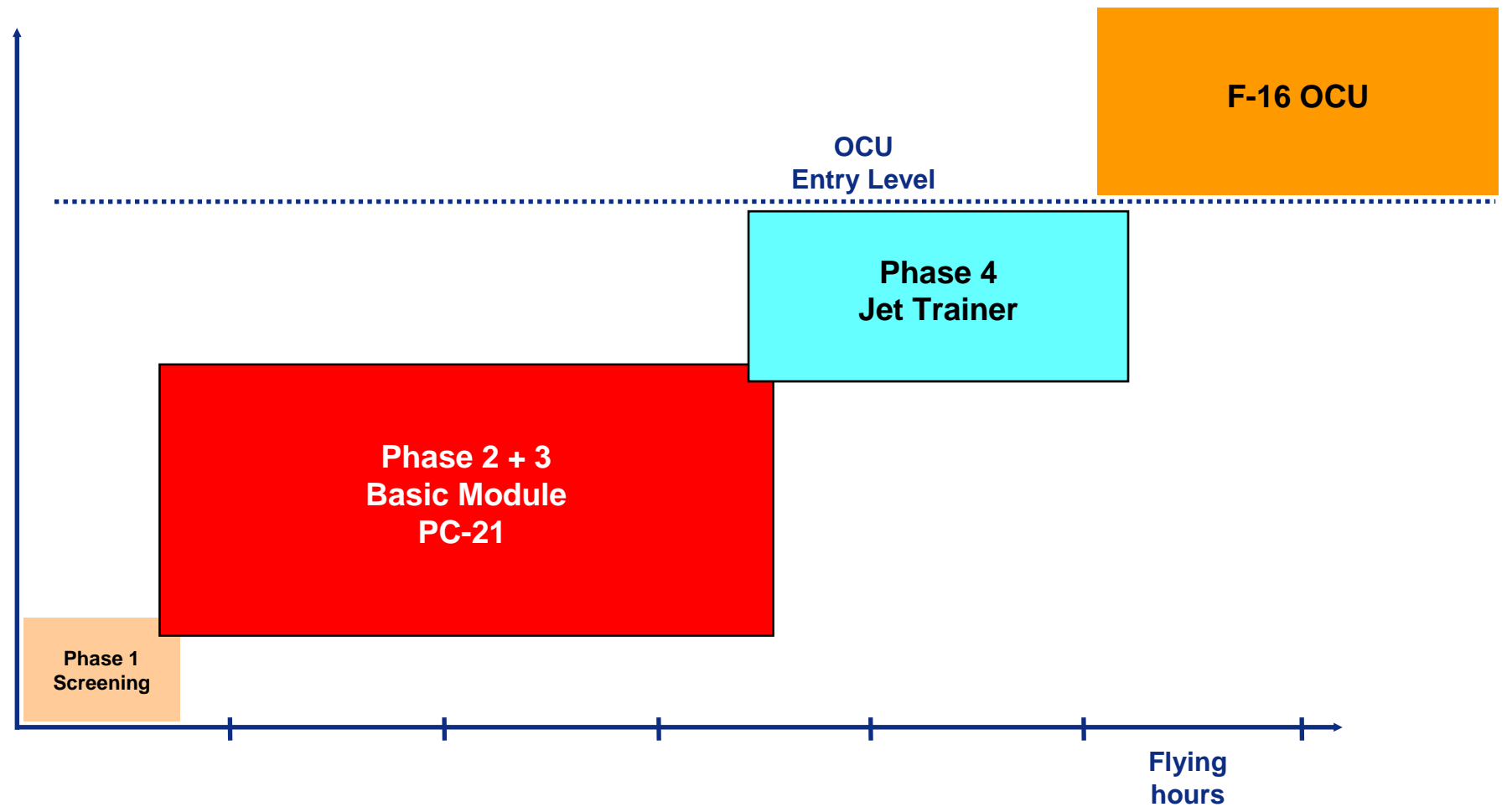
PILOT TRAINING PIPELINE

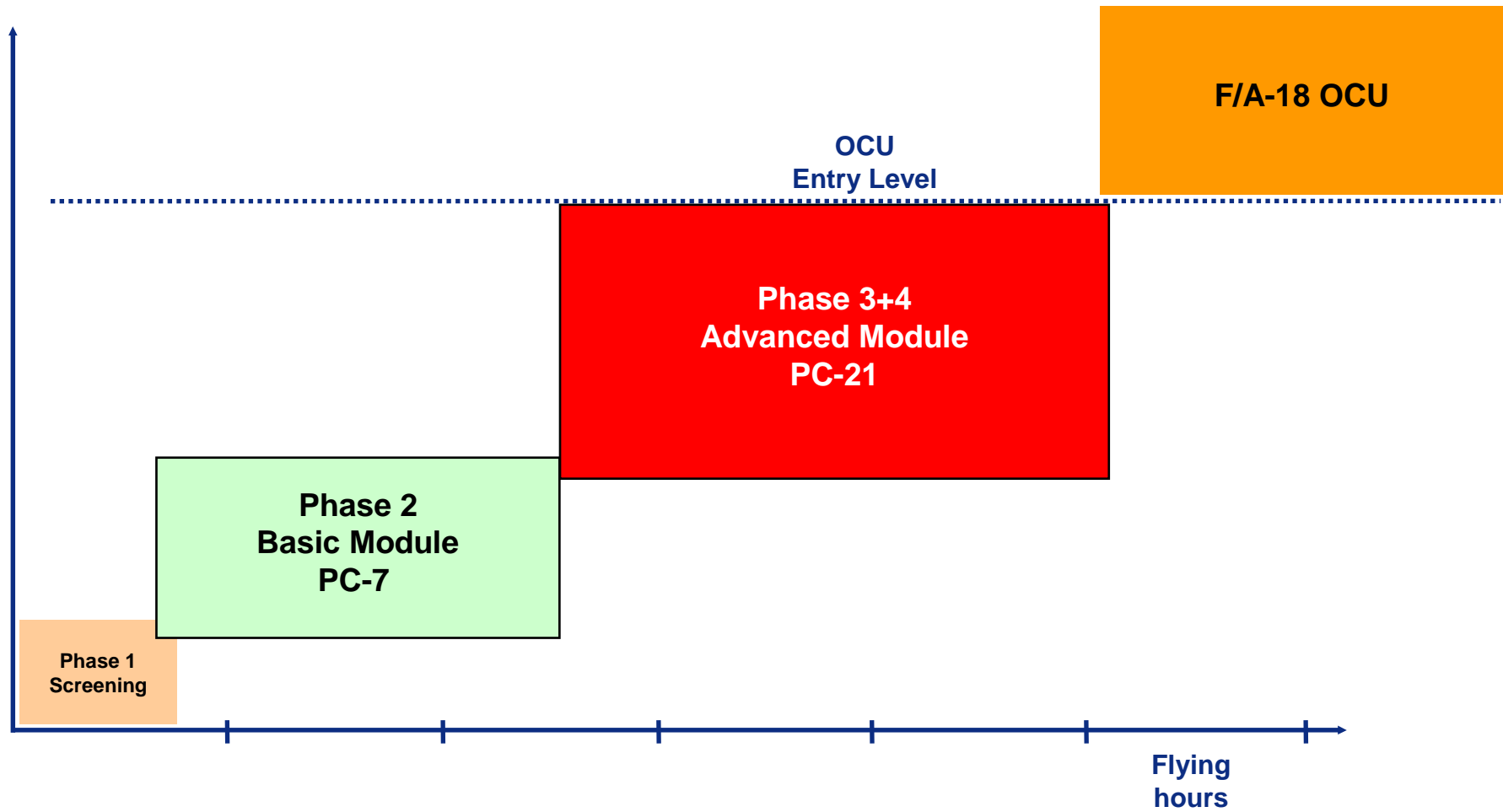


TRADITIONAL TRAINING SYLLABUS



FLEXIBILITY → CURRENT CUSTOMER







Summary PC-21 Training System

- ✓ Most flexible and reliable Training Platform
- ✓ Very high Safety Level
- ✓ Modern Human-Machine Interface
- ✓ New Generation Fighter like Cockpit
- ✓ State-of-the-Art Avionics and ES&T
- ✓ Most powerful and cost-effective Integrated Training System
- ✓ Significant cost savings through low Life-Cycle-Cost

THANK YOU FOR YOUR ATTENTION

