



I2007

Simulazione, Modellizzazione e
Interoperatività in Italia nel Modelling & Simulation
Opportunità per il 2007

Modelling & Simulation in Aerospace

Alenia Aeronautica's experiences and
perspectives

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In early 2005, researchers at the Italian Modelling & Simulation Association (MIMOS) discovered, buried in oblivion for many decades in the basement of Turin's Technical University, the remains of **two devices** dating back to the very early days of aviation (**1916**) and used to assist in assessing potential aviators' aptitude.

Modelling & Simulation is today a well established practice in Aerospace in Italy, mainly focused on:

- Flight training
- Ground based systems training (e.g. Air Traffic Control)

but also used for

- Operational analysis
- System's definition, design, development and testing

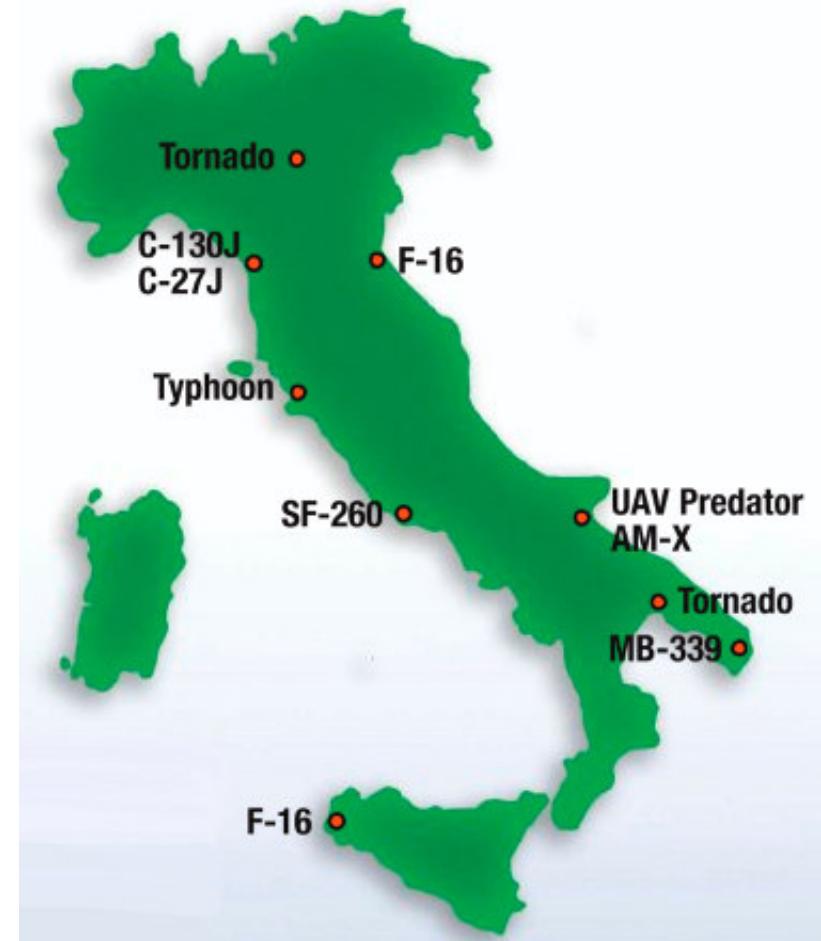


- Set up a suitable environment for the **research** of innovative technologies, methodologies and solutions to be applied to new projects
- Support to **design**, from initial concept to entry into service
- Support to definition of **pilots' normal & emergency procedures**
- **Test pilots familiarization** and **flight test rehearsal**
- **Demonstration** of aircraft capabilities and performances to Customers
- Support to **aircraft mid-life updates**
- Engineering simulators: **aircrews initial training** in the Company
- Training simulators: **aircrews training** at the Customers' sites

Simulation in the Italian Air Force *



- **Eurofighter Typhoon:** ASTA Simulators @ Grosseto and Gioia del Colle, Alenia Aeronautica's ACPT2 and E-ACPT3 & 4 (TBC) @ Grosseto. Also (interim solution): Flight Simulators @ Torino (Alenia Aeronautica) and 1 ASTA Cockpit Trainer @ Ronchi dei Legionari (Galileo Avionica)
- **C-130J*:** Operational Flight Trainer and other devices (LM Aero / CAE) @ Pisa
- **C-27J Spartan*:** Alenia Aeronautica's Flight Simulator and other devices (TBC) @ Pisa (prospective)
- **Tornado*:** 2 CAE / Galileo Avionica's Full Mission Simulators @ Ghedi and Gioia del Colle
- **AMX*:** 2 Tactics and Procedures Training Systems at Amendola and Istrana
- **F-16*:** 2 Part Task Trainers @ Trapani and Cervia
- **MB339CD*:** 1 Full Mission Simulator @ Lecce
- **SF-260*:** 1 Procedural Trainer @ Latina
- **Predator*:** 1 Full Mission Simulator @ Amendola
- **Air Traffic Control (ATC) Training Facility* @ Pratica di Mare**



* source MS&T Magazine, Issue 3/2006

Alenia Aeronautica



Alenia Aeronautica, a Company of FINMECCANICA and a founder member of MIMOS, is **the Italian leader in aeronautics** and one of the major European players in aerospace

Mission: **design, manufacture and support of military and civil aircraft and related systems**

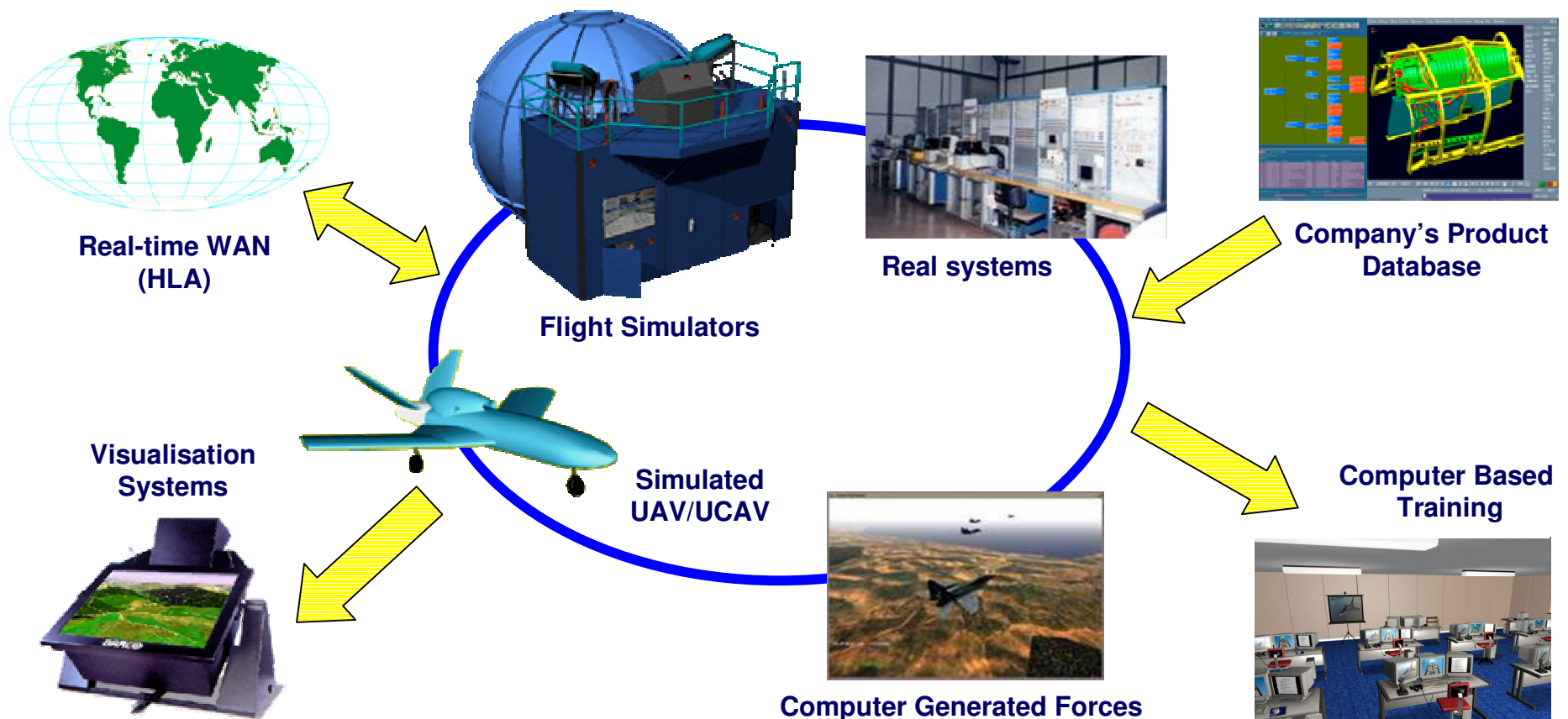
Modeling & Simulation is a **key technology** of the Company
First simulator developed in 1961



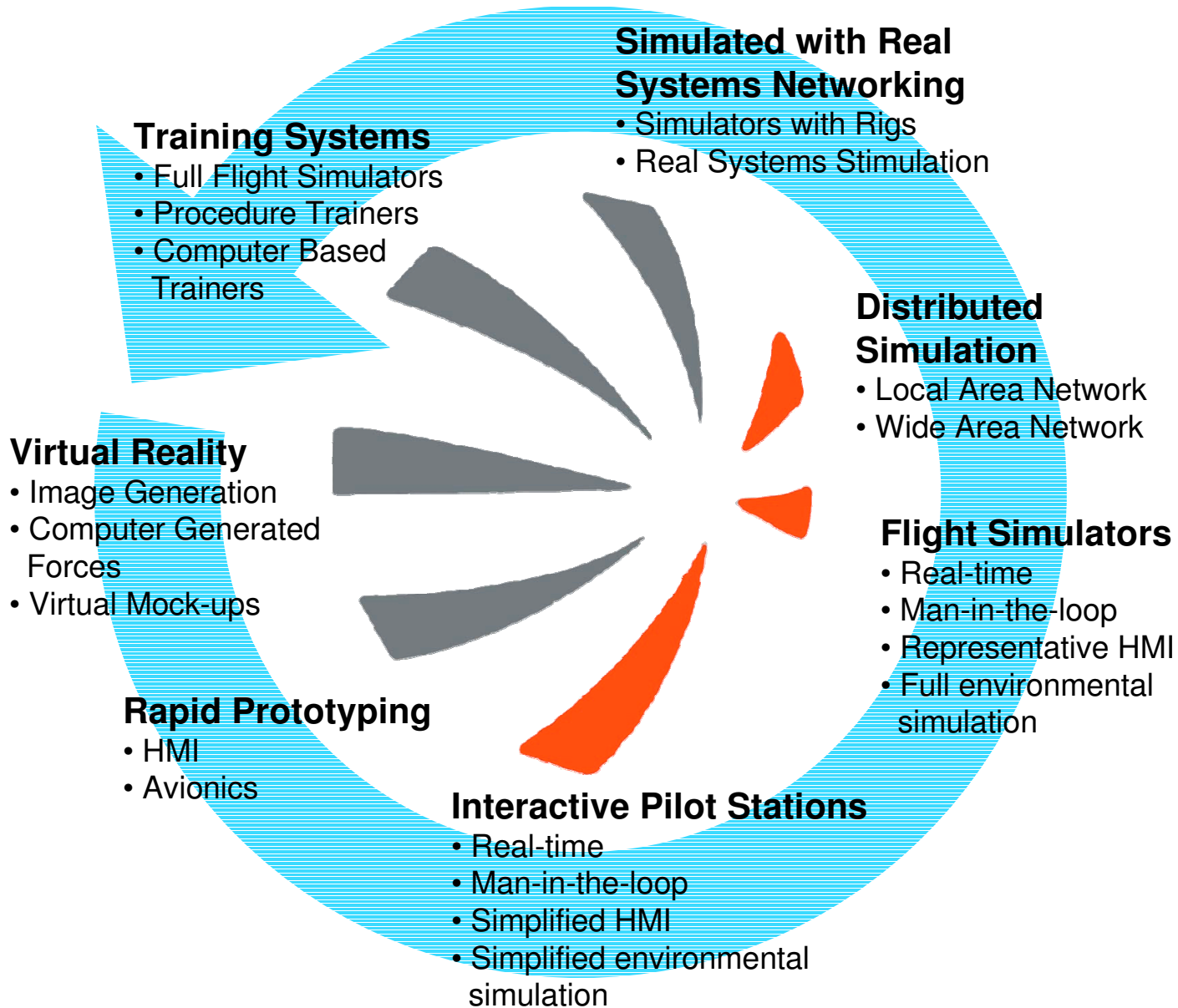
- Since it was established in Torino in the early 60'ies, **the Alenia Aeronautica Simulation Centre designs, develops and operates flight simulators**, along with hardware and software tools required for their integration.
- These simulators are mainly used to support the development of the aircraft that Alenia performs autonomously or, more commonly, in the frame of national or international collaborations. In particular, programs such as **AMX, Eurofighter Typhoon, C-27J Spartan** and the **UAV “Sky-X” demonstrator** have been extensively supported since their early stages by one or more dedicated simulators.
- The Simulation Centre takes advantage of the **Human Machine Interface** specialists, included in the same organization with the Simulation specialists, as major contributors and users of the simulation facilities.

The Synthetic Environment

- Synthetic Environment: “an integrated simulation environment, inclusive of human operators, real systems and virtual models, linked together in an **interactive, real-time** and **distributed** simulation architecture”
- The Synthetic Environment is the **main instrument** of the Alenia Aeronautica Simulation Centre



Alenia Aeronautica Synthetic Environment: main components

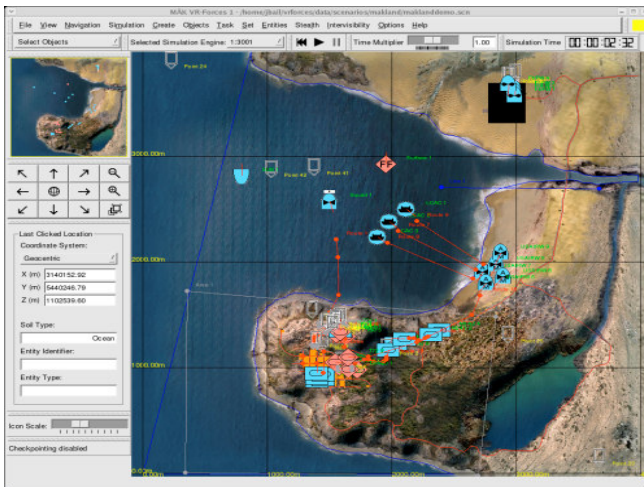


Virtual Reality & Rapid Prototyping



- System's requirements and relevant **conceptual model development**
- **Quick and cheap** representation of the System and its functionalities

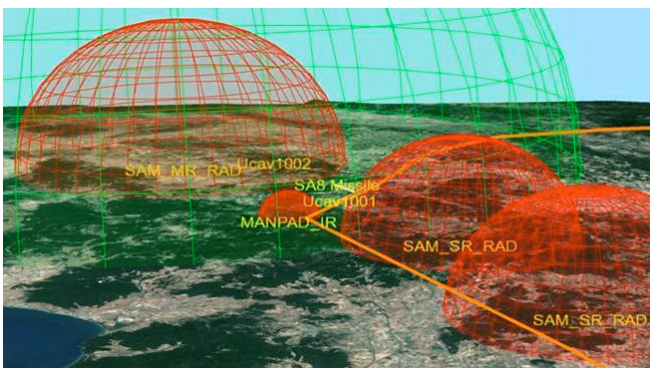
Computer Generated Forces



Alenia Aeronautica "Sapphire"
Image Generator



Experimental UAV CS,
presented at Le Bourget 2005



Tactical Scenario

VAPS Station

Virtual Mock-up, presented at
Farnborough 2006

Interactive Pilot Stations

- First stage of **real-time man-in-the-loop simulation**
- **Good interaction level** with the pilot/operator, who can test the overall system



Eurofighter IPS/ACPT1 (2003)
(Aircrew Cockpit Procedure Trainer)



UCAV Lab (2003)

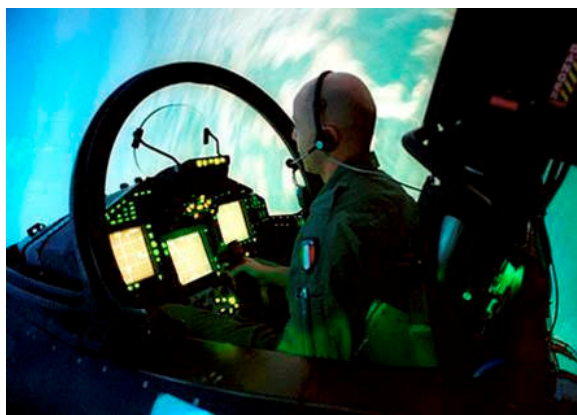


LINCE UAV IPS (2006)



Flight Simulators

- Flight Simulators allow real-time man-in-the-loop simulation in a **highly representative, completely integrated environment**



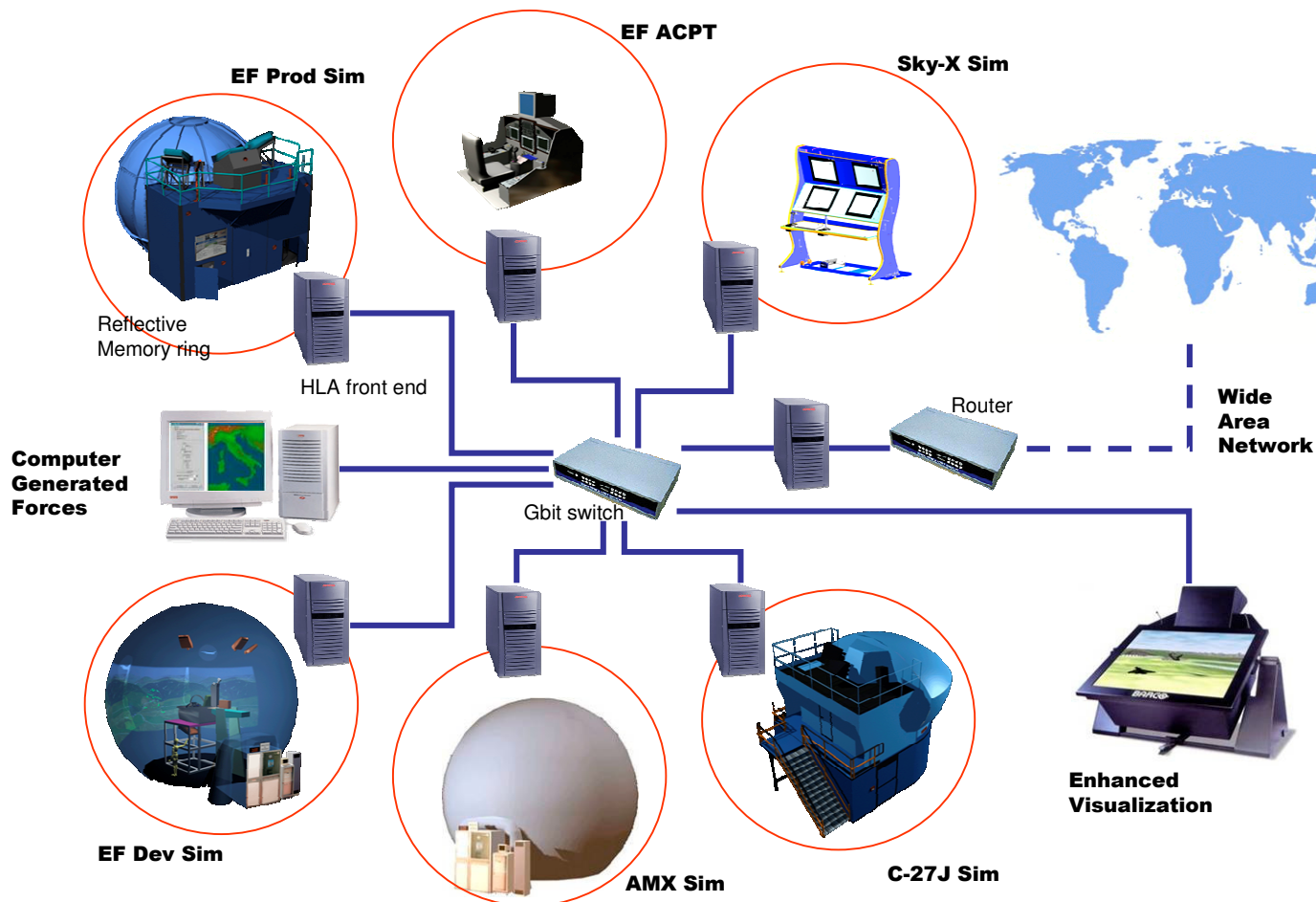
Eurofighter Engineering Simulator
(2000)

C-27J Engineering Simulator
(2001)

Sky-X UAV Simulator (2003)

Distributed Simulation

- Distributed Simulation allows recreating the **maximum complexity of the operational scenario**, with applications in both engineering and training fields



NATO's First WAVE (2004)

Simulated with Real Systems Networking



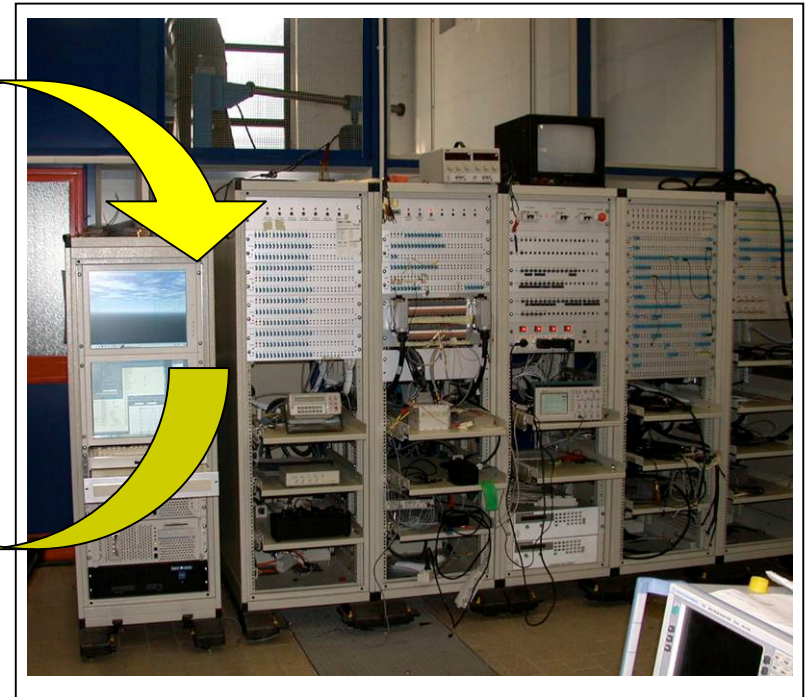
- **Real-time, man&hardware-in-the-loop simulation** allows the pilot/operator to “fly” the real thing on the ground
- The simulator is used to stimulate the real system (rig or aircraft)



Sky-X Simulator Console



Sky-X Simulator Host System



Sky-DASS
(Data Acquisition
Stimulation & Simulation)

Sky-X Rig

Training Systems



- The development of **Training Systems** is the **natural follow-on** of the simulation employment to define, design and develop the aircraft system

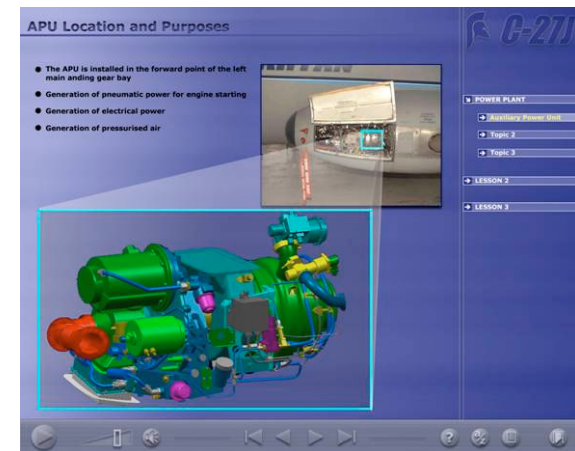
Eurofighter Desk Top Trainer



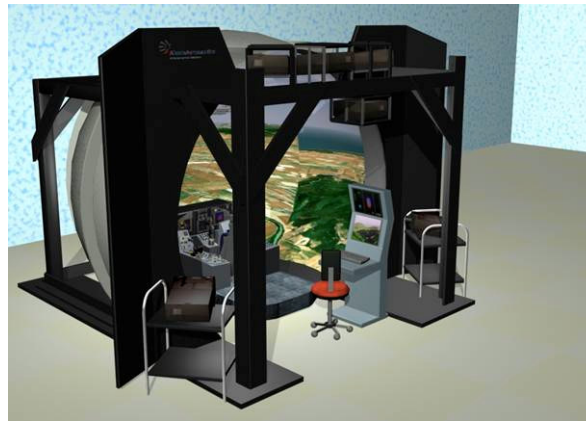
Eurofighter ACPT2



C-27J CBT



Eurofighter Maintenance Simulator Trainer



Eurofighter E-ACPT3 & 4

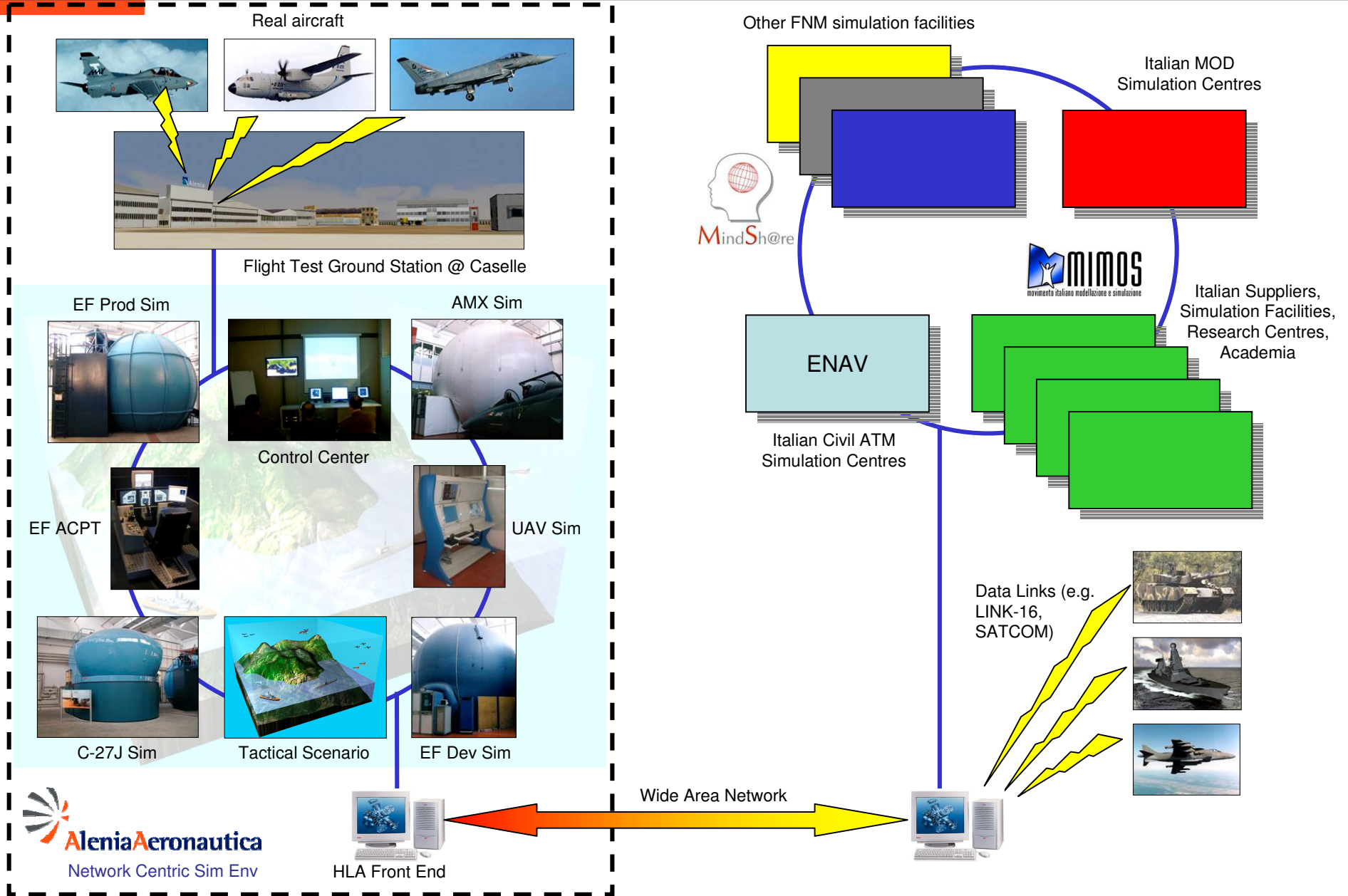


C-27J Flight Simulator

- **Network Centric Simulation Environment (NCSE):** the application of the Synthetic Environment to the study of Network Centric Operations
- Collaboration among Finmeccanica Companies in order to share experiences, skills and applications in the frame of the **Italian effort to develop Systems Interoperability and introduce Network Enabled Capabilities (NEC)**



NCSE – A prospective view



Conclusions

- Modelling & Simulation is a well established practice in the Aerospace field in Italy
- Simulation Centres based on Synthetic Environment are powerful means for the definition, design, development and test of Aeronautical Systems
- Adopting common standards and practices and sharing information and experiences can enable fruitful cooperation among the Modelling & Simulation communities in Italy
- **Thank you for the attention!**

