

German Aerospace Center

## DLR RT-Simulation of a Flight Research Test Vehicle Based on an EC135 Helicopter



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## **Outline**

- ☞ **Introduction**
- ☞ **Active Control Technologies / Flying Helicopter System (ACT/FHS)**
  - **Spectrum of Use**
  - **System Architecture**
- ☞ **System Simulation**
  - **Tasks**
  - **Simulation Facilities**
  - **Helicopter Interface Computer (HIC)**
- ☞ **Cockpit Interface (COS) Simulation**
  - **Mode Switching**
  - **Signal Consolidation**
  - **Flight Controls Trim System**
- ☞ **Software Architecture**
- ☞ **Conclusion**



## Introduction

### ☞ Main Research Activities

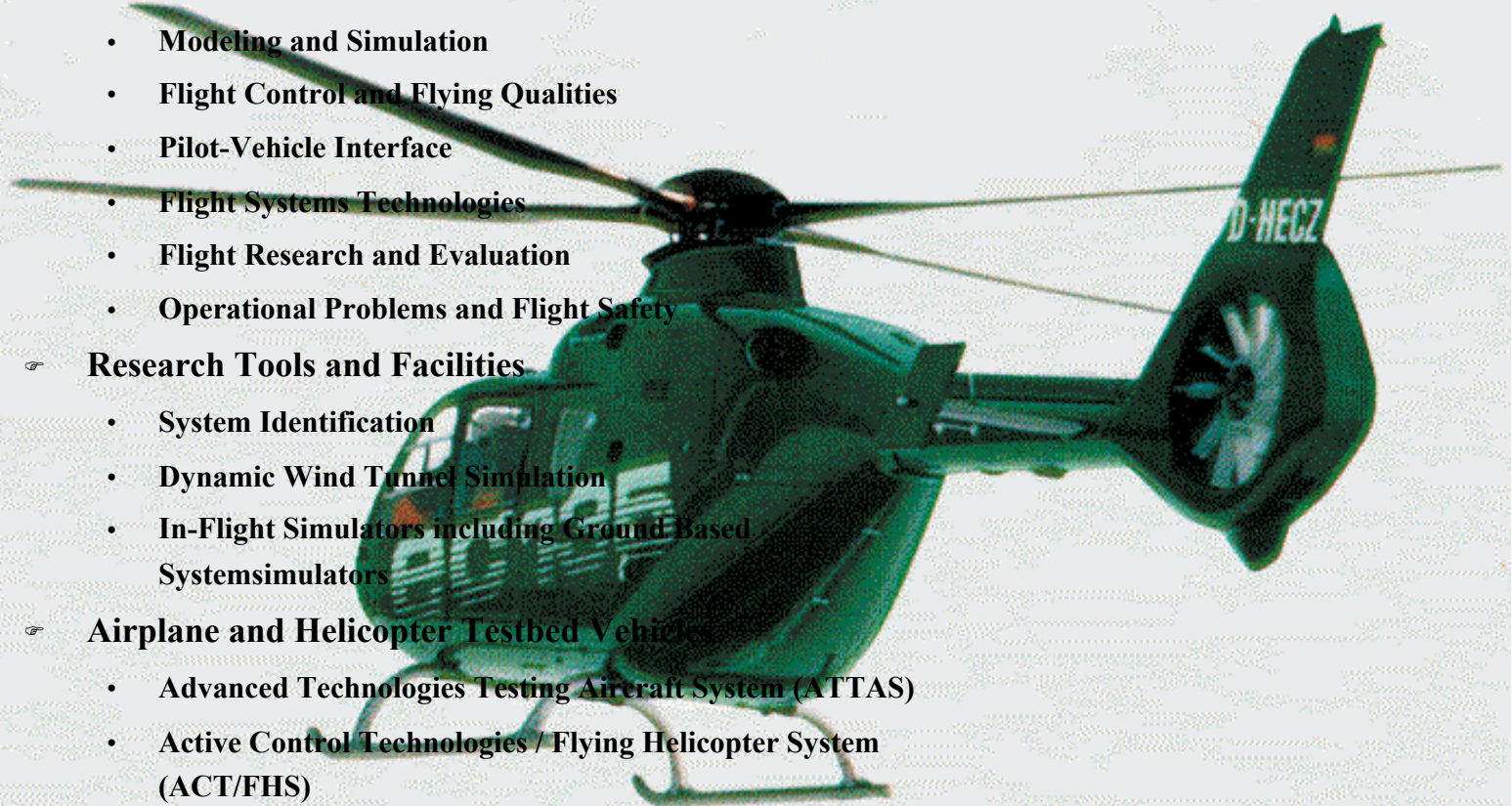
- Modeling and Simulation
- Flight Control and Flying Qualities
- Pilot-Vehicle Interface
- Flight Systems Technologies
- Flight Research and Evaluation
- Operational Problems and Flight Safety

### ☞ Research Tools and Facilities

- System Identification
- Dynamic Wind Tunnel Simulation
- In-Flight Simulators including Ground Based Systemsimulators

### ☞ Airplane and Helicopter Testbed Vehicle

- Advanced Technologies Testing Aircraft System (ATTAS)
- Active Control Technologies / Flying Helicopter System (ACT/FHS)

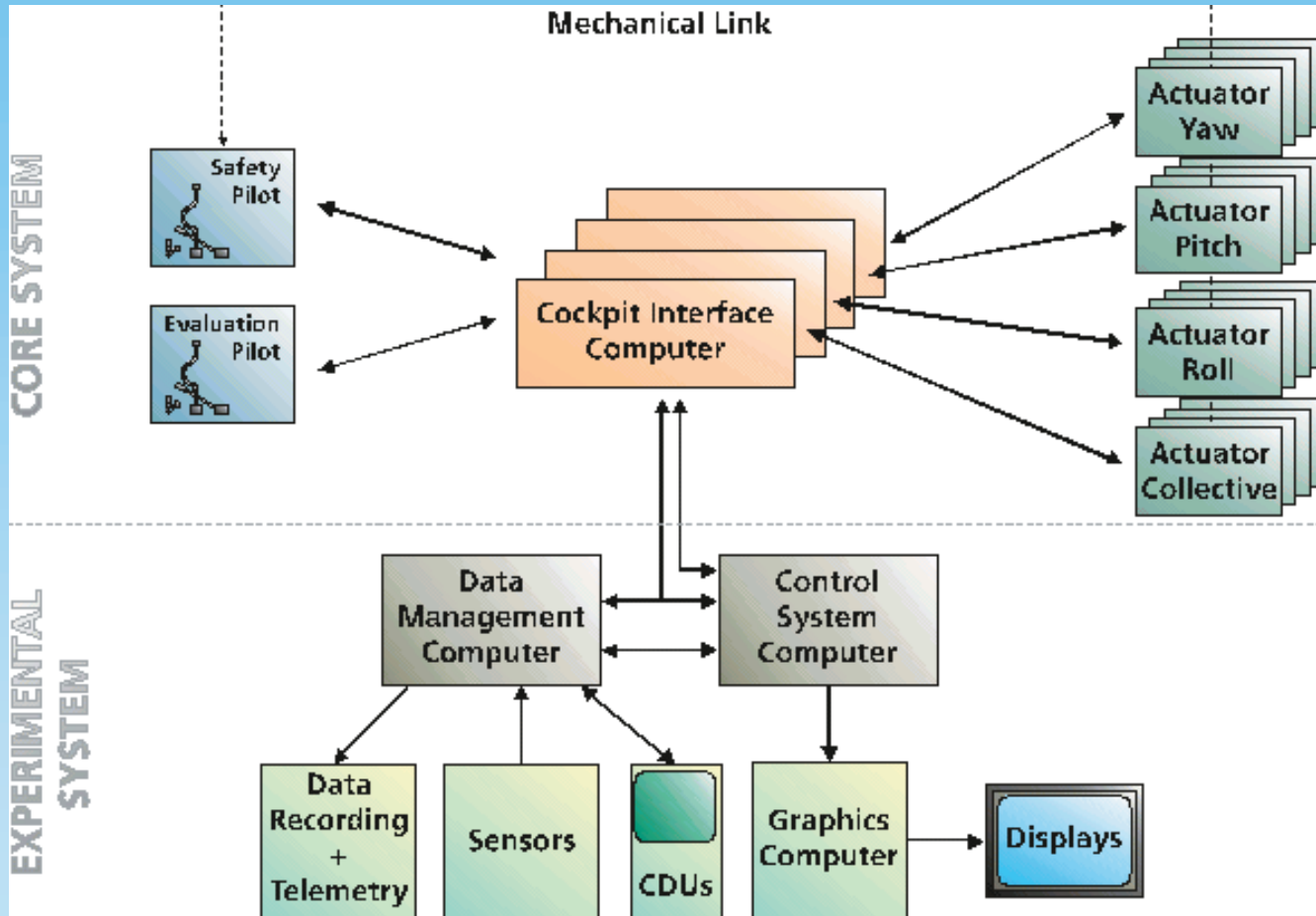


## **ACT/FHS Spectrum of Use**

- ☞ **In-Flight Simulation**
  - **Helicopter Simulation**
  - **Flying Qualities**
  - **Pilot Training**
  
- ☞ **System Development**
  - **System Architecture**
  - **Control Systems**
  - **Cockpit Systems**
  - **ACT Functions**
  
- ☞ **Technology Demonstration**
  - **Functional Aspects**
  - **Certification Aspects**



# ACT/FHS System Architecture



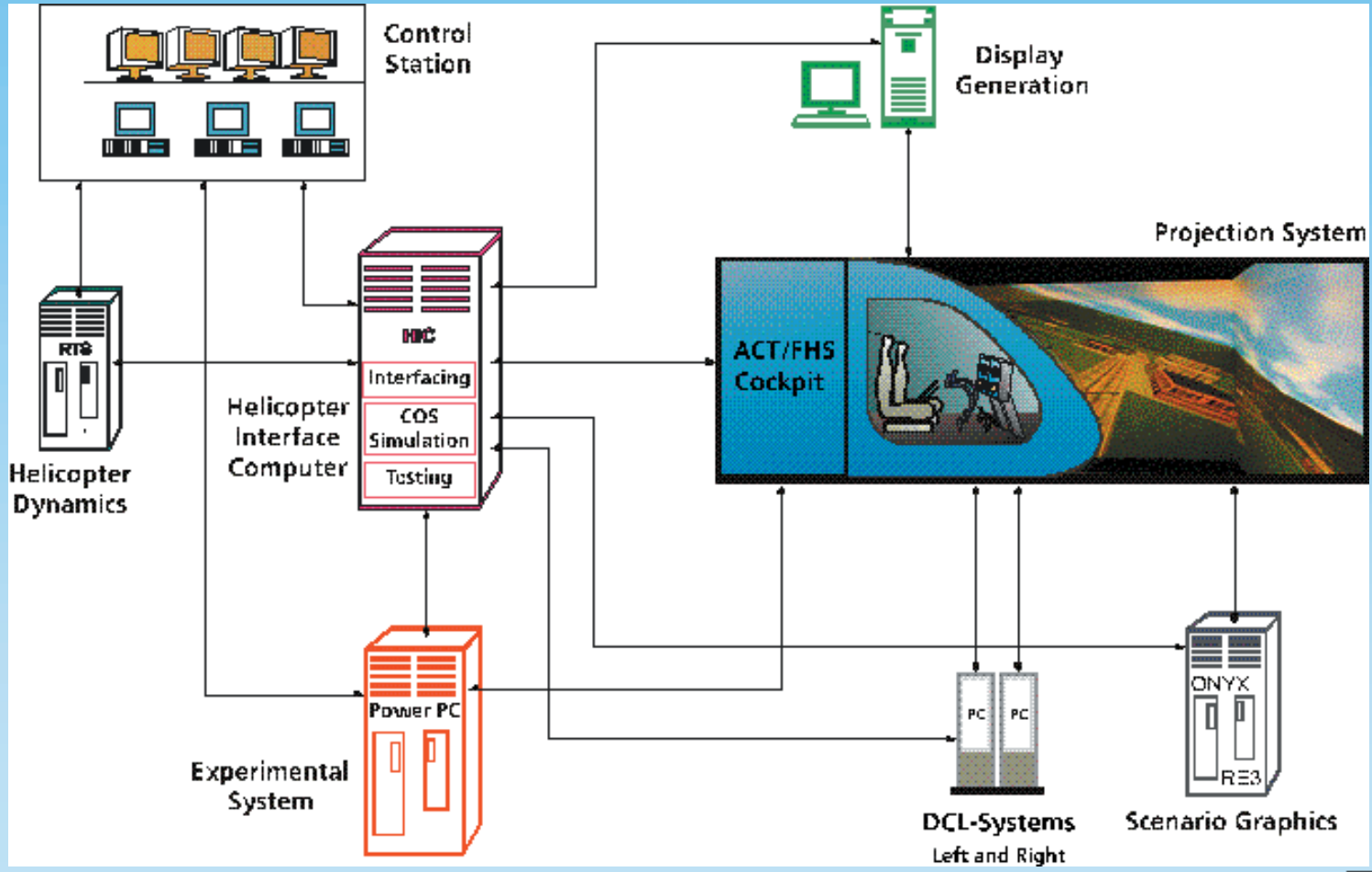
## **System Simulation Tasks and Benefits**

- ☞ **Integration and Validation of the Experimental FBW - Software**
- ☞ **Integration and Test of hardware components**
- ☞ **Crew Training for Flight-tests**

### **↪ Major Benefits**

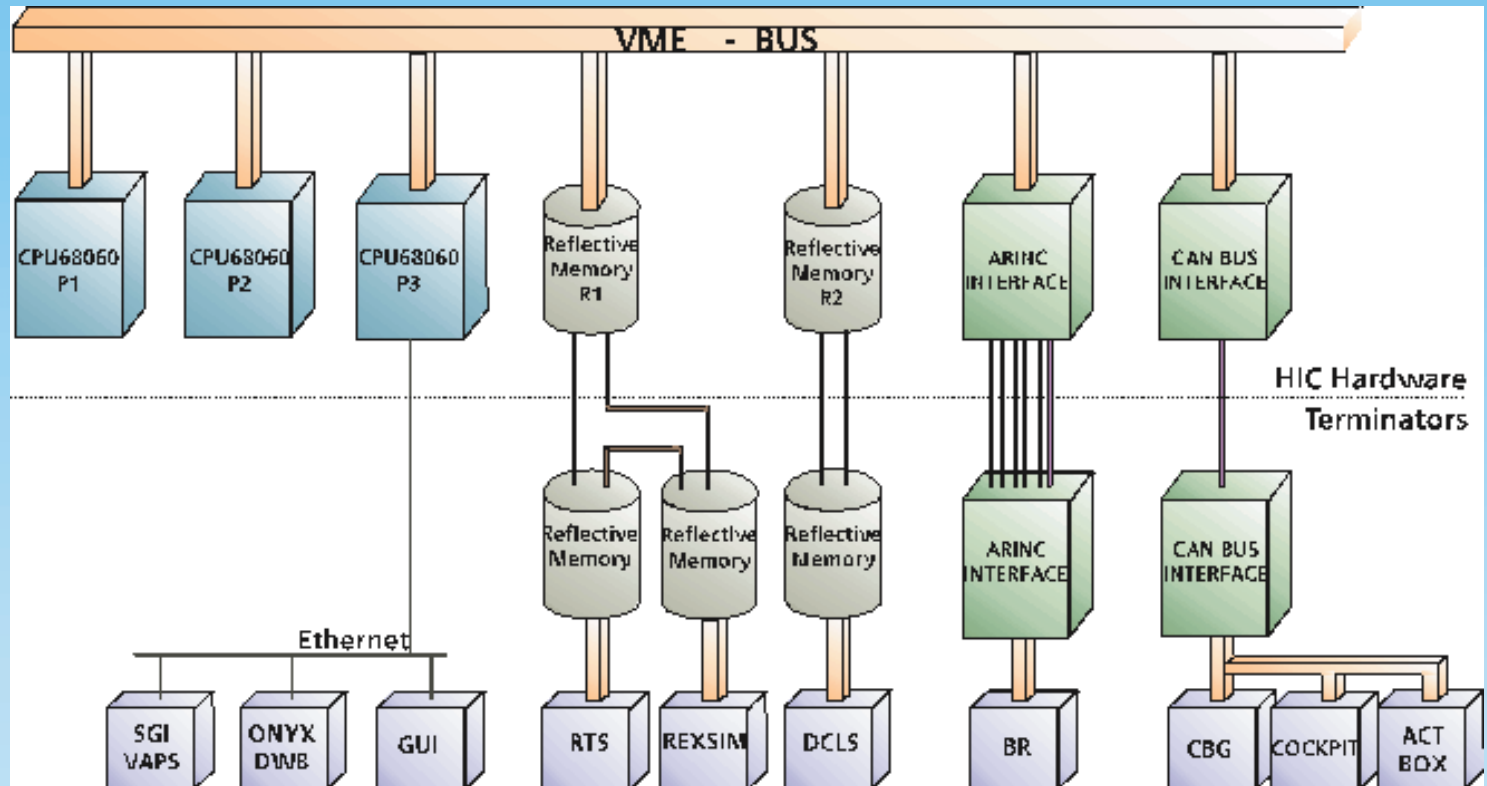
- **Involvement of pilots' rating during the development process**
- **Decrease of experimental flight time**
- **Reduction of costs and development risks**

# System Simulation Facilities



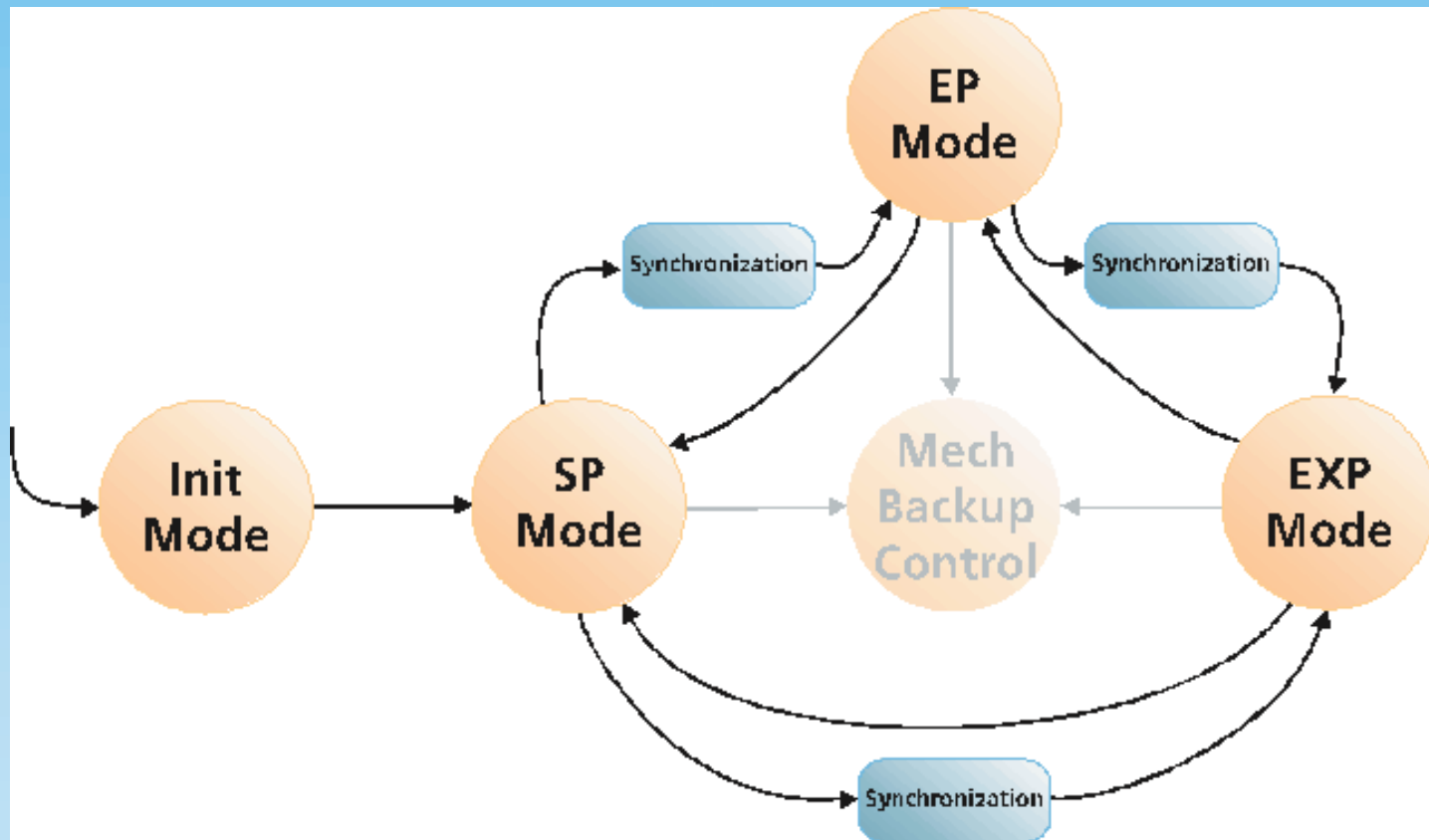
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## HIC Hardware Architecture

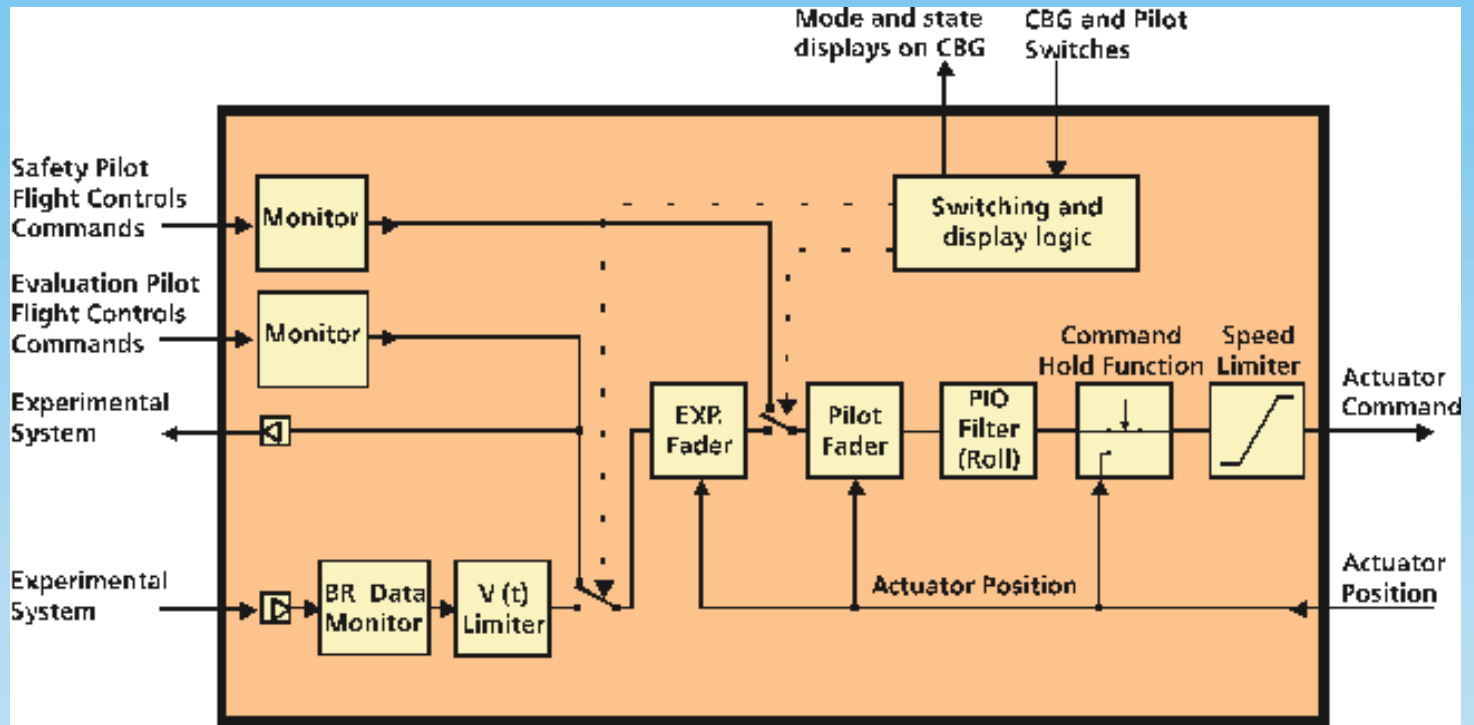




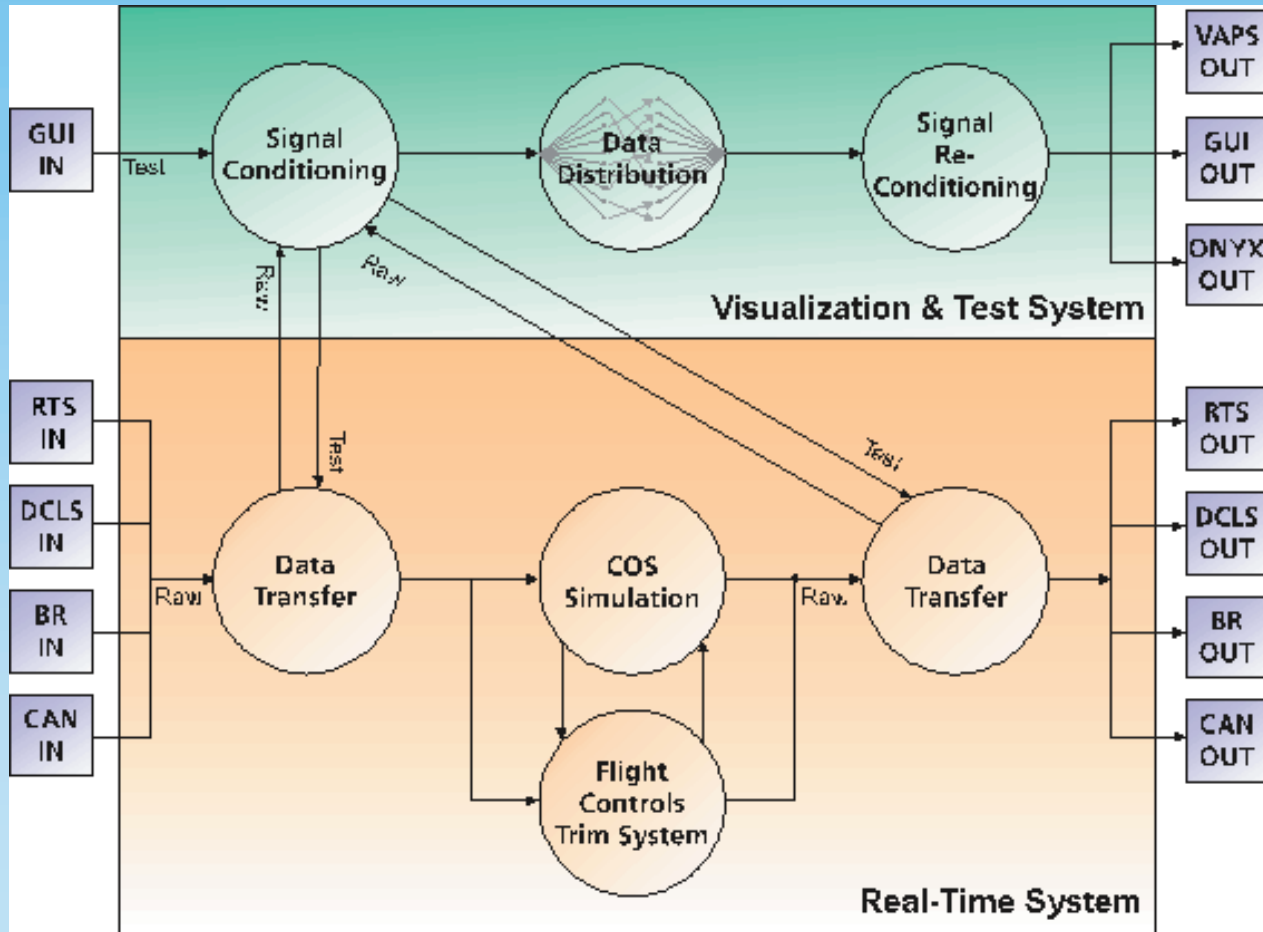
## COS Simulation Modes and Transitions



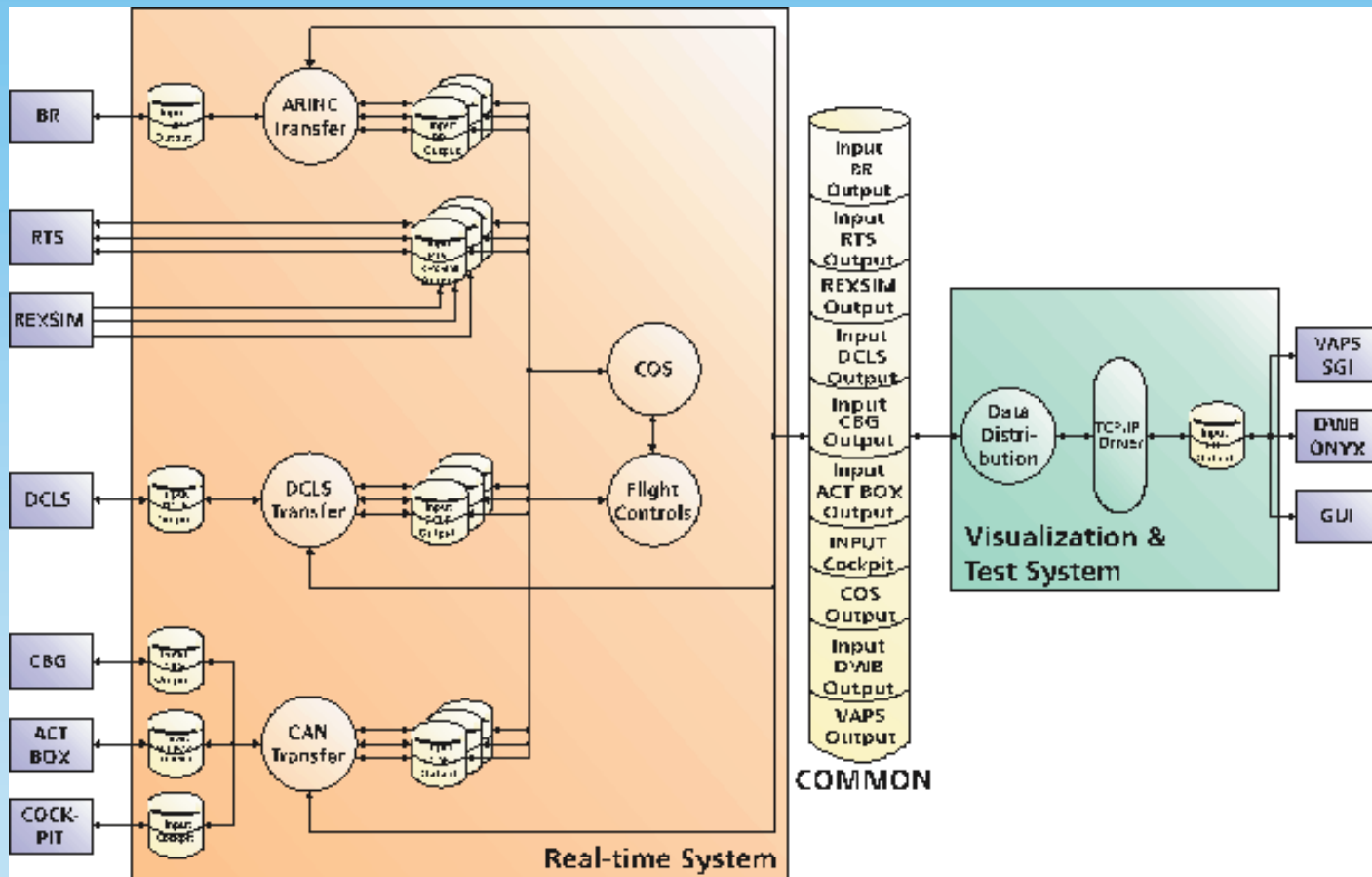
# Cockpit Interface Signal Consolidation



# HIC Software Architecture



# HIC Software Architecture



## **Conclusion**

- ☞ **Actual System Simulation State (NOV 1999)**
  - **Mode Switching in Operation**
  - **COS Functionality implemented**
  
- ☞ **Flexible Setup of the Hardware Structure**
  
- ☞ **Structured Software Architecture for Incremental Delivery Approach**
  
- ☞ **Operative Level of the System Simulation in March 2000**
  - **Integration and test of the experimental computer system**
  
- ☞ **Operative Level of the Airborne System in 2001**