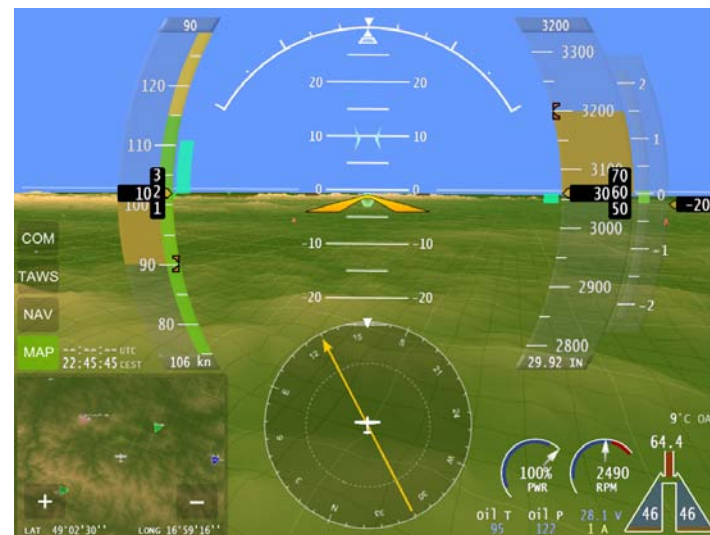


HIL Simulation of a Light Aircraft Flight Control System

#0 Content

1. Motivation
2. Framework
3. Control scheme
4. Peripheral systems
5. Simulation and Verification
6. Concluding remarks



#1 Motivation

- **Flying become more accessible.**
- **Questions about safety of light aviation.**
- **Inexperienced pilots with limited training are ill prepared for critical situations.**
- **New COTS technologies for GA & LSA require thorough testing!**

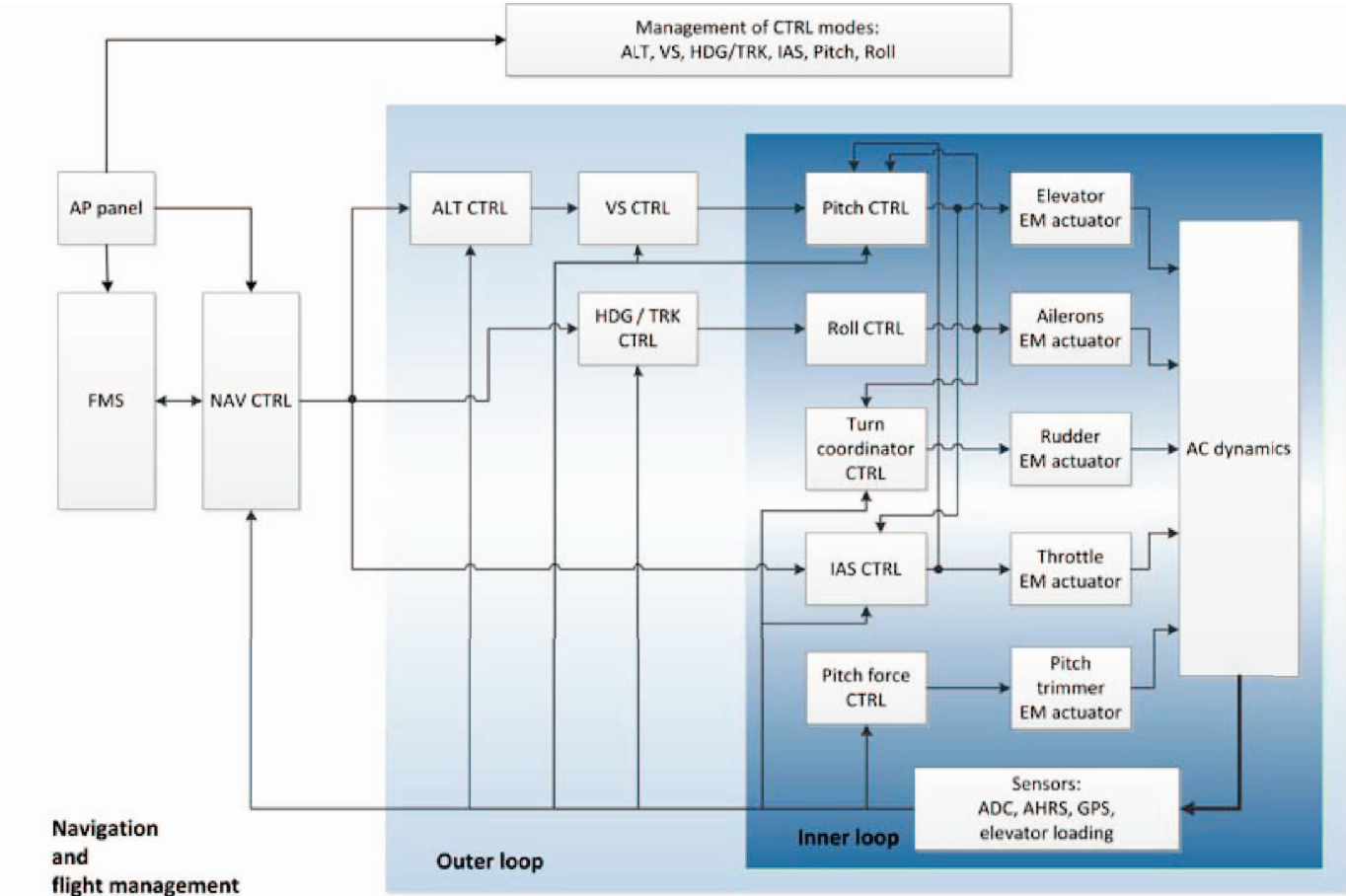
#2 Simulation framework

- **Core is SimStar simulator.**
 - SportStar's non-linear dynamic model,
 - X-Plane dynamic model,
 - Dynamic model written in Matlab or C/C++.
- **CANaerospace protocol support for HIL.**
- **Embedded data acquisition system.**

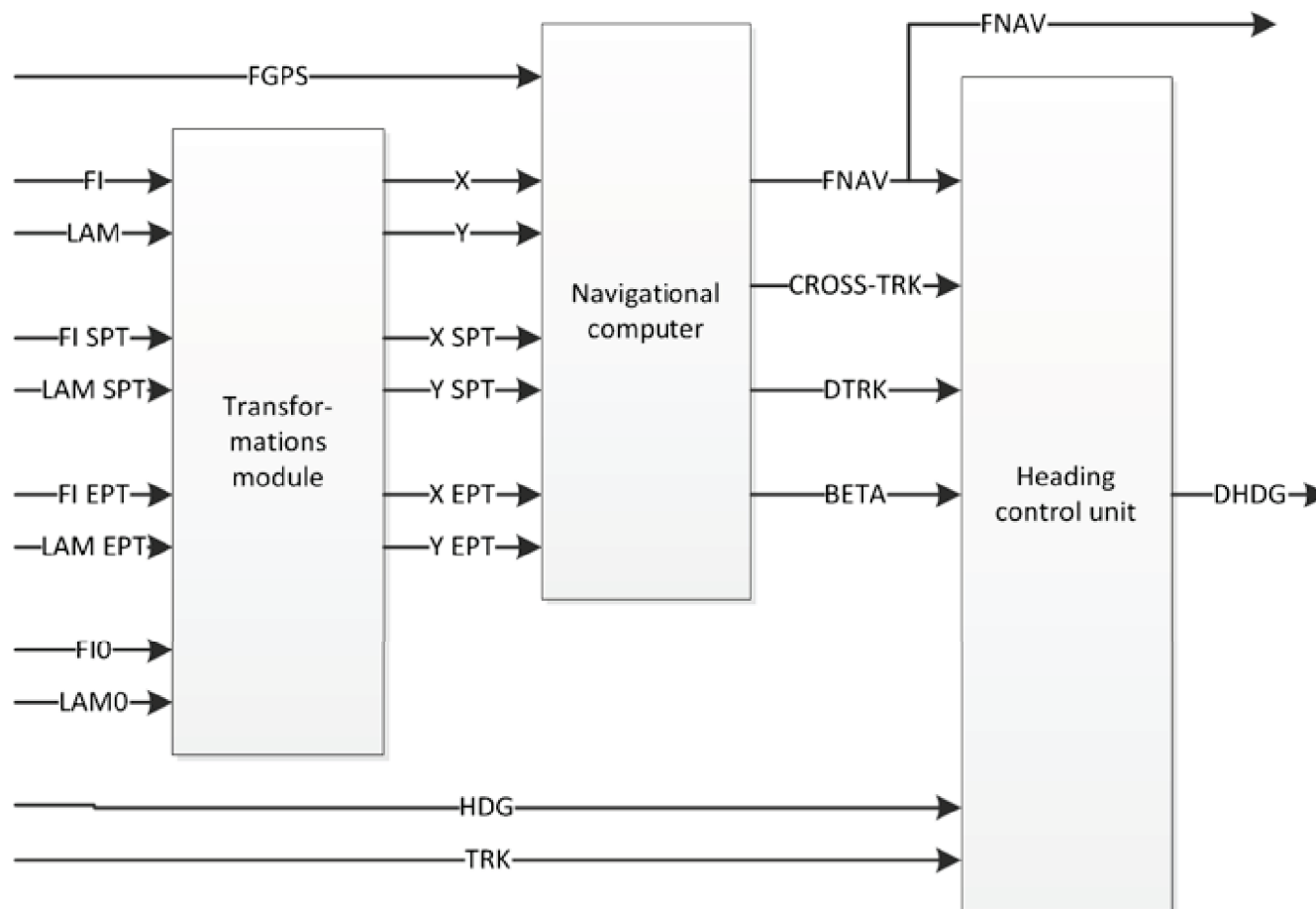
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#3 Control Scheme



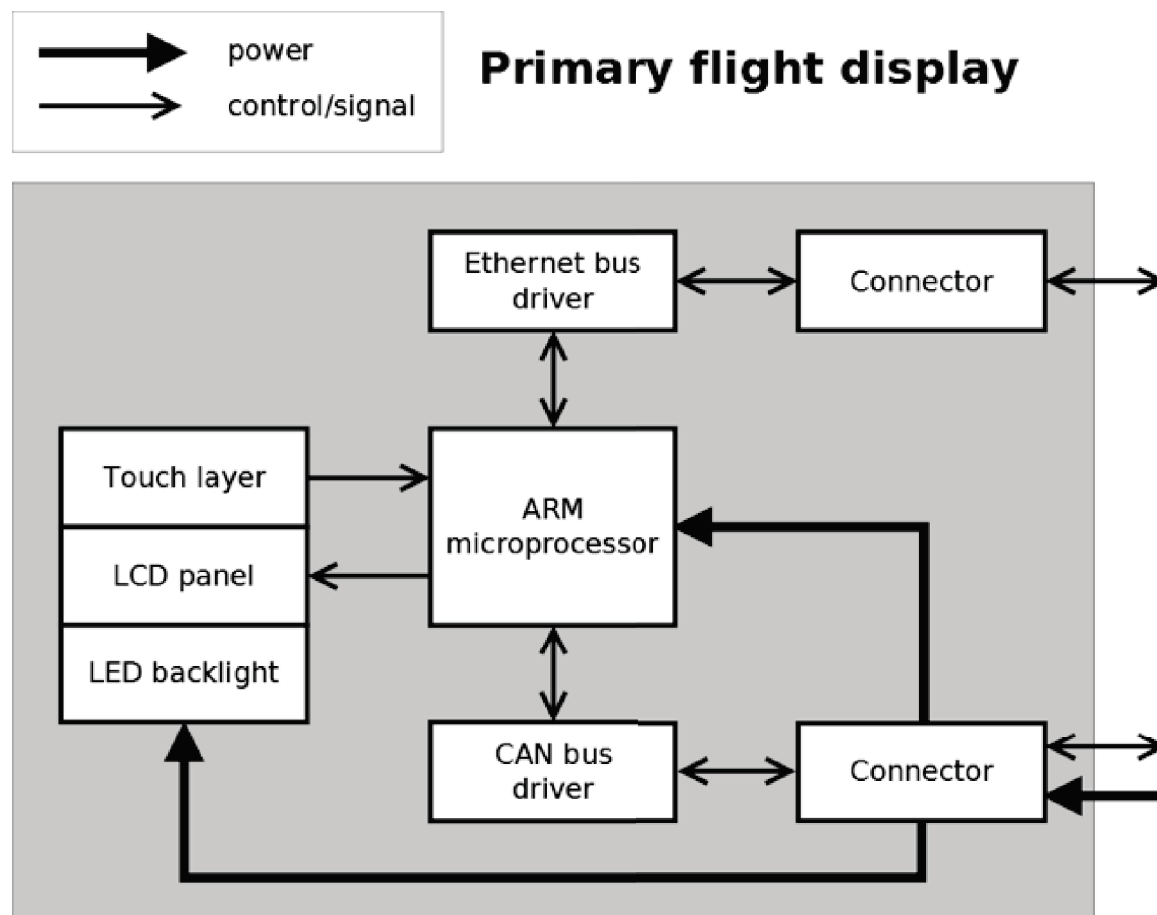
#3 Control Scheme – Navigation controller



#4 Peripheral systems

- **Developed peripherals:**
 - **Primary Flight Display,**
 - **Autopilot Mode Selection Panel,**
 - **Electromechanical Actuator.**
- **Connected via CANaerospace.**

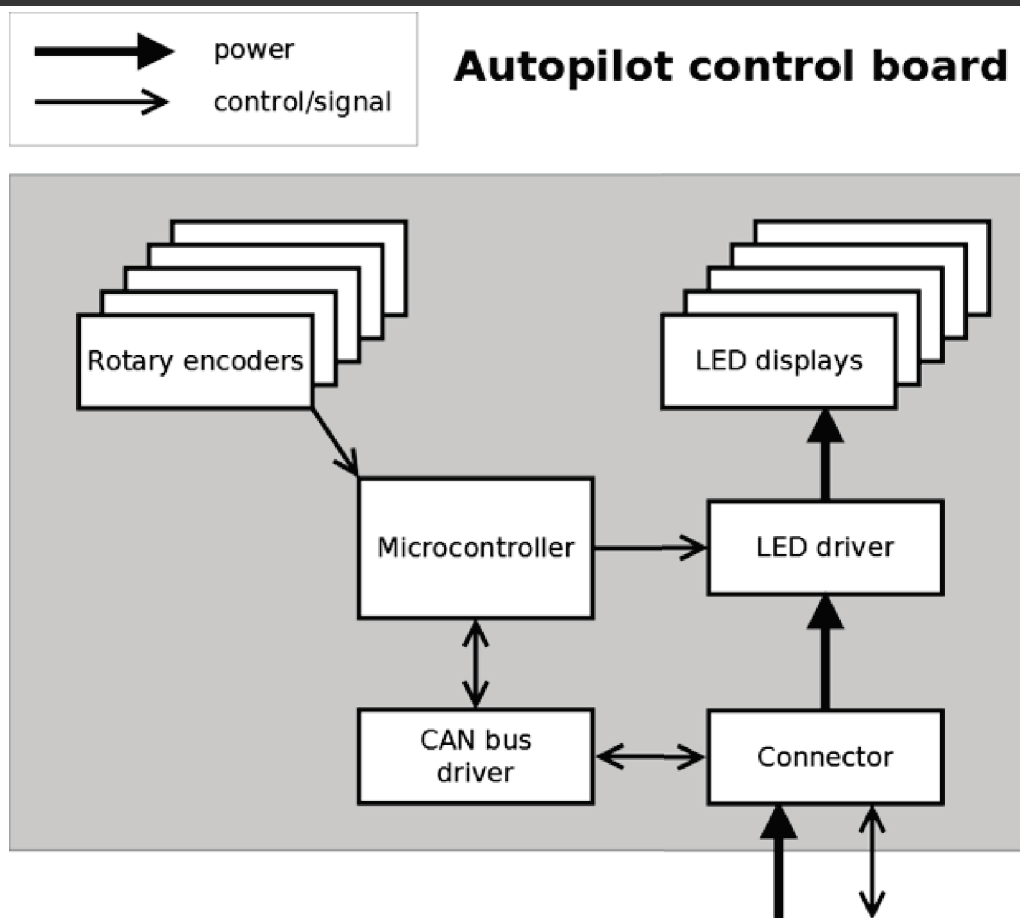
#4 Peripheral systems



#4 Peripheral systems – PFD integration



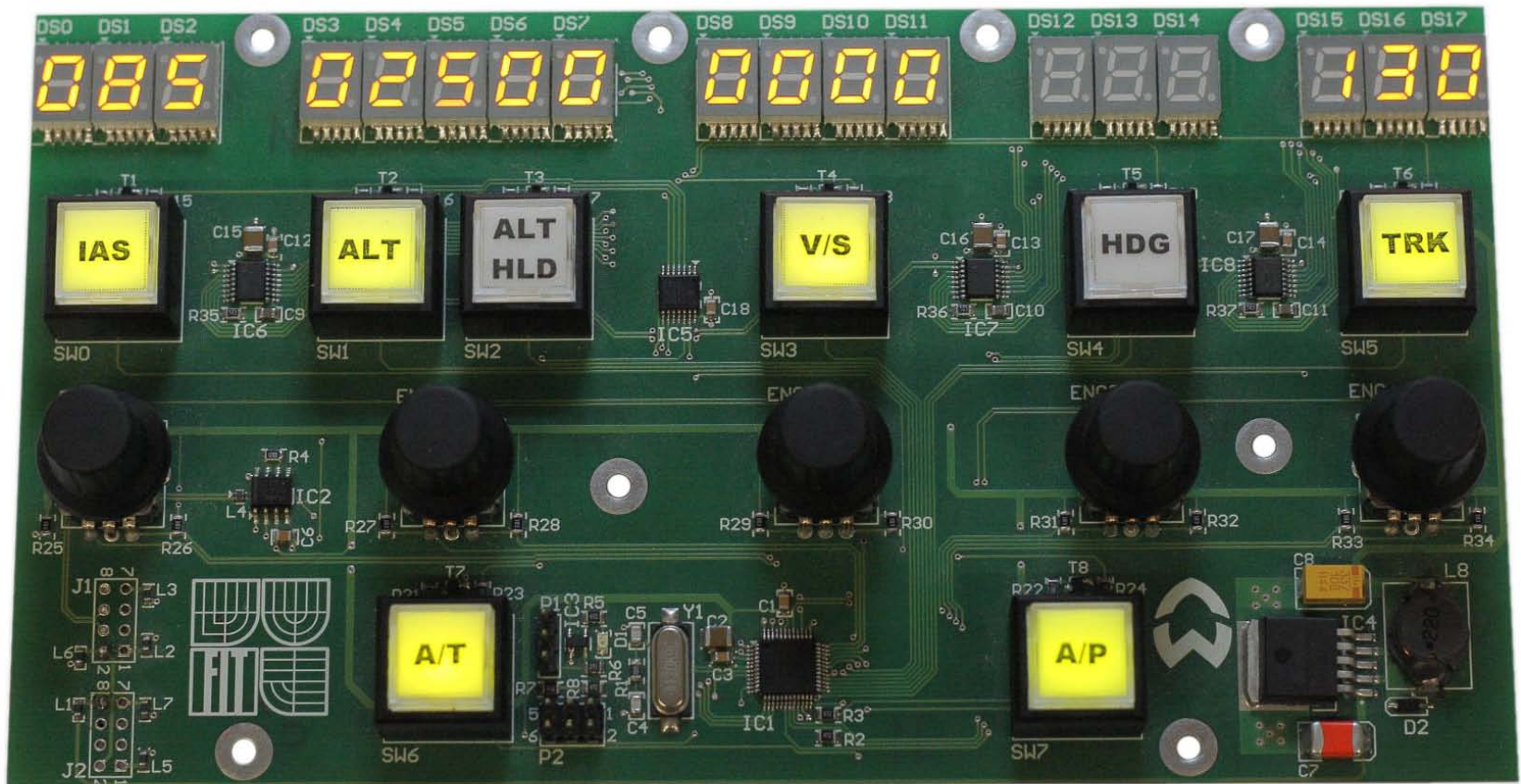
#4 Peripheral systems



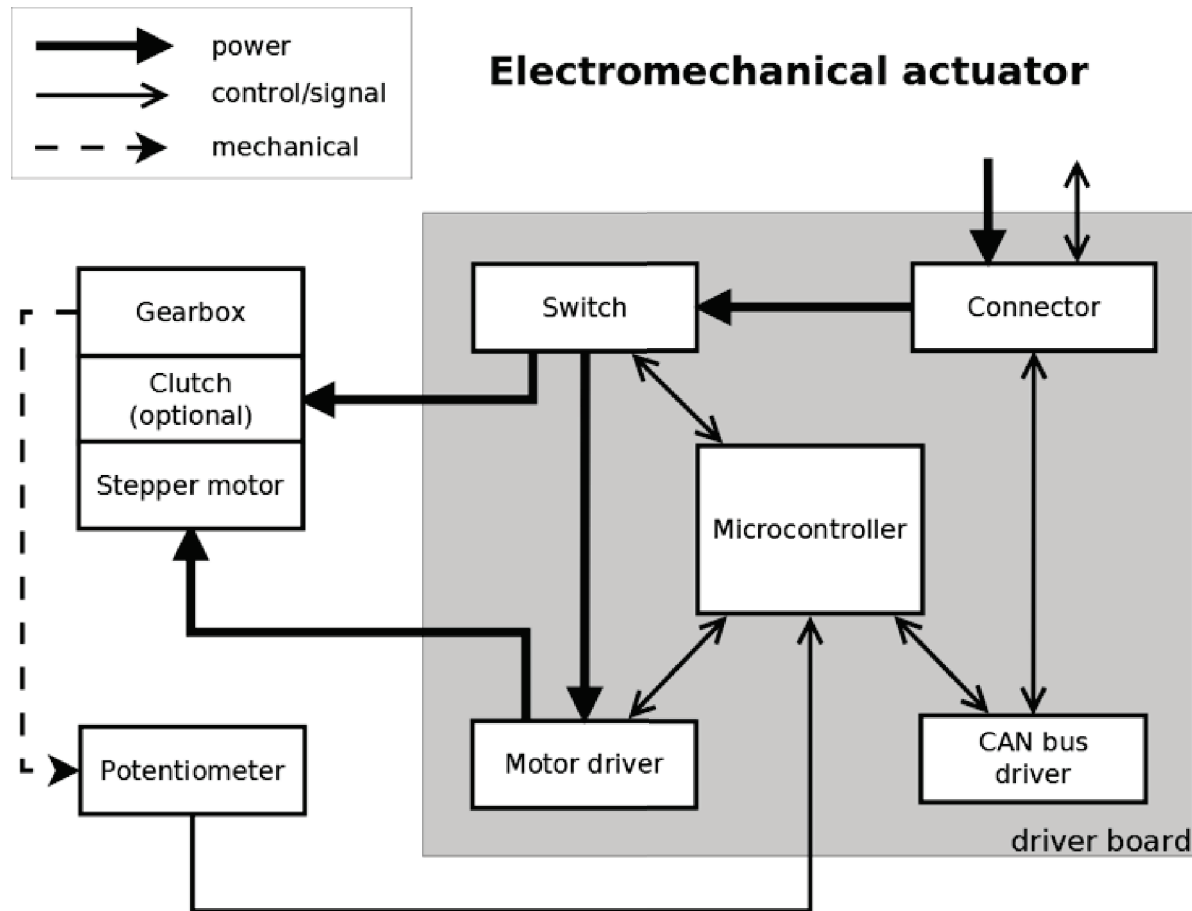
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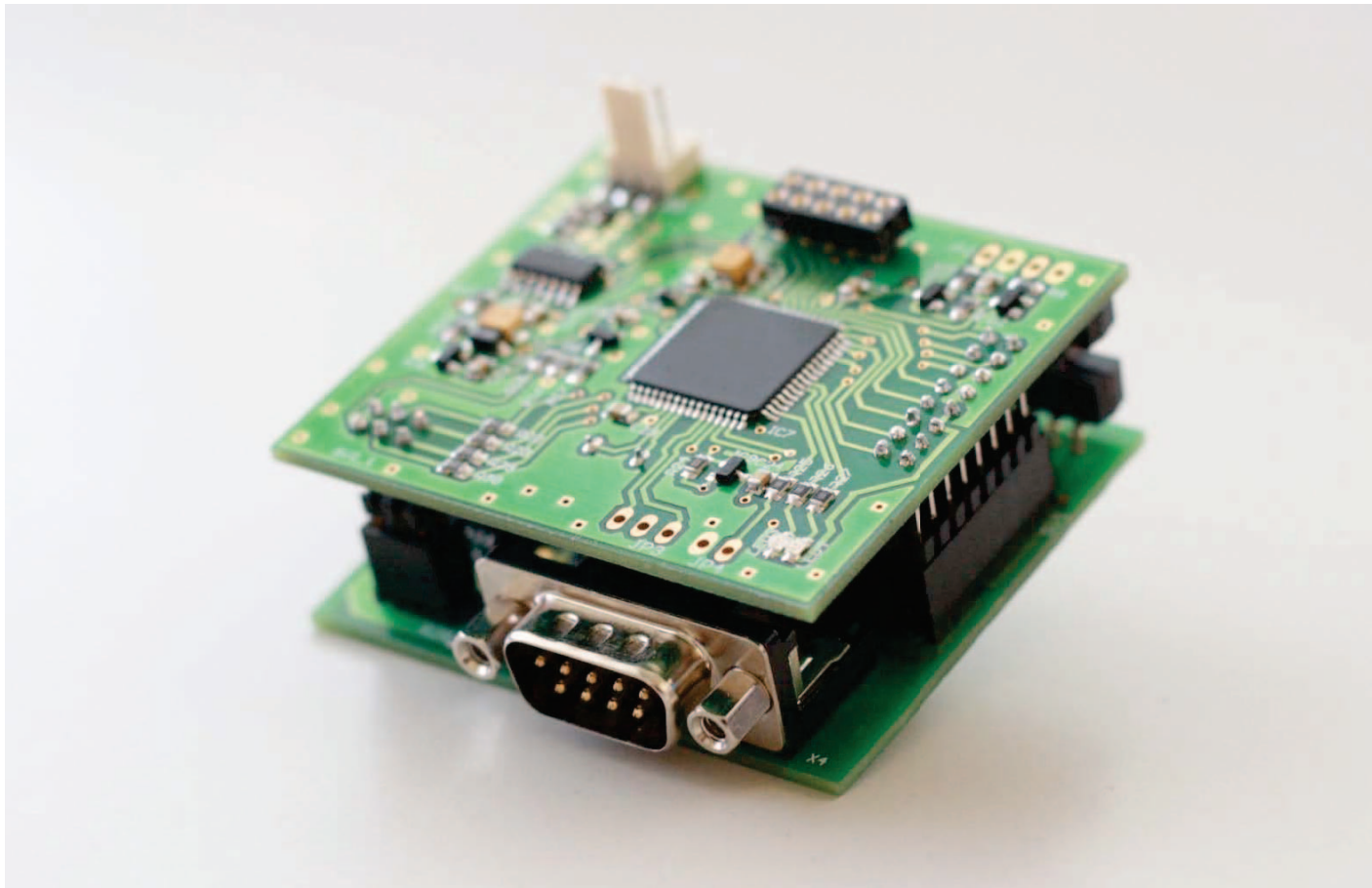
#4 Peripheral systems – AP control board



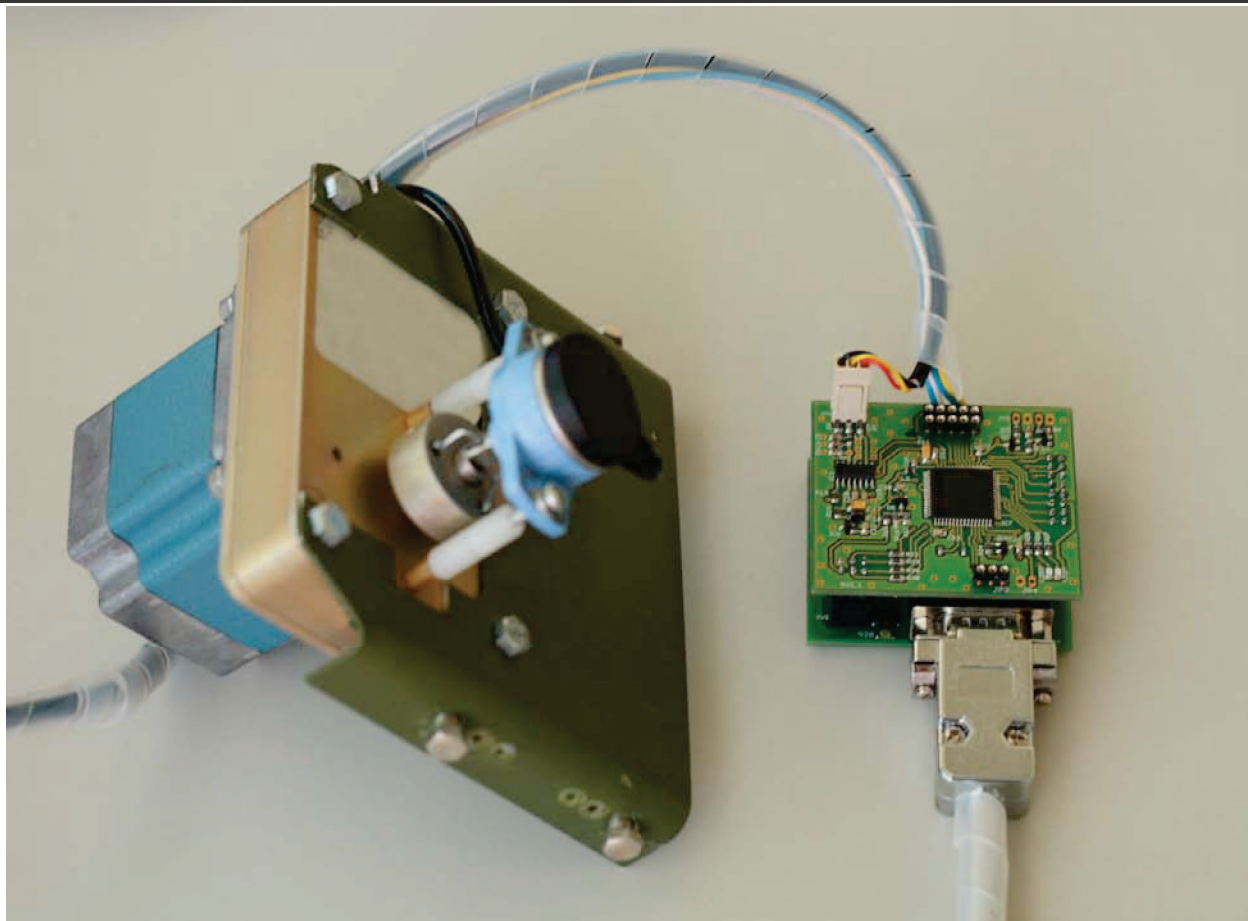
#4 Peripheral systems



#4 Peripheral systems – EMA control board



#4 Peripheral systems – EMA assembly



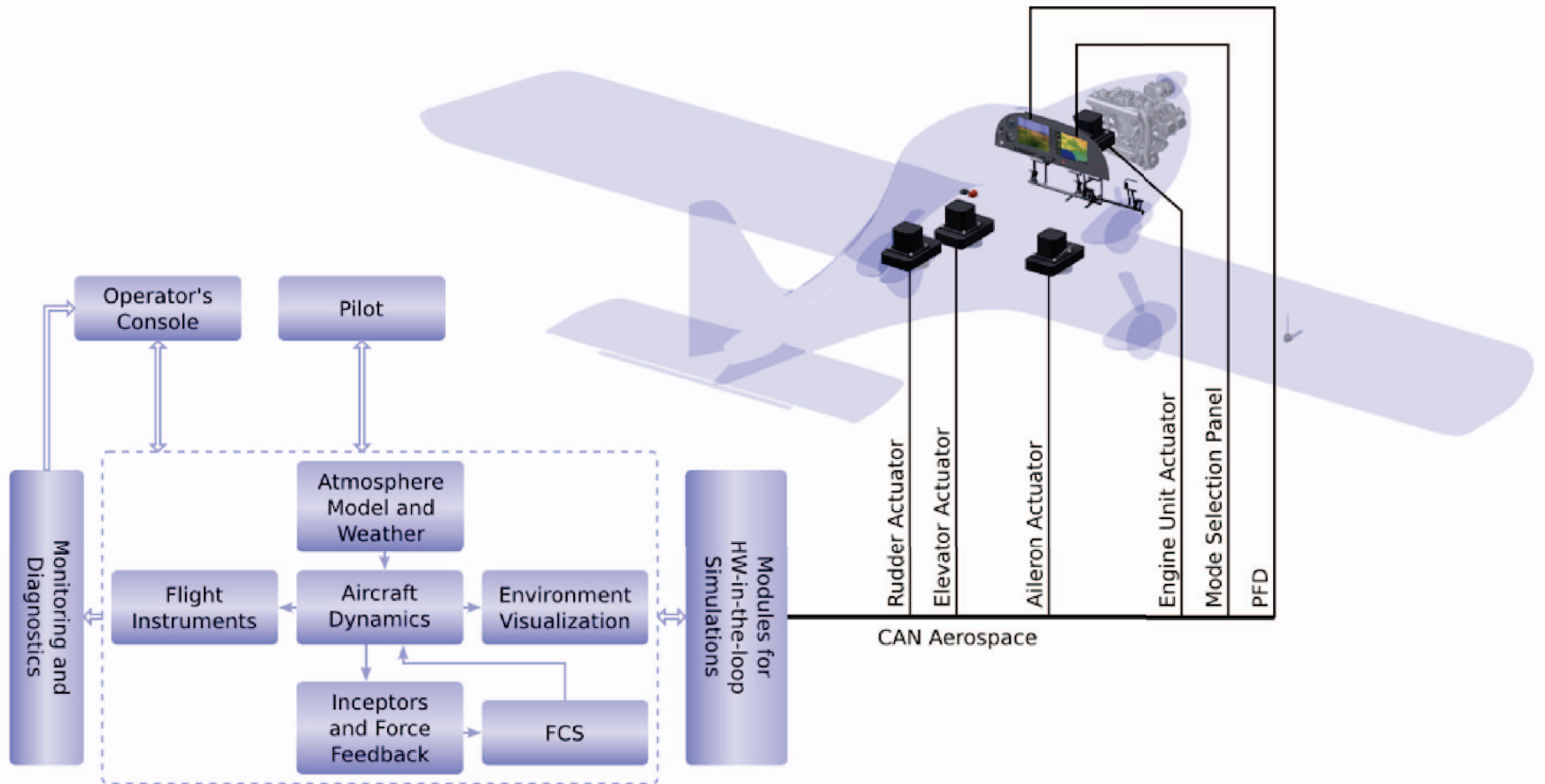
#5 Simulation and Verification

- **Simulation framework.**
- **SimStar laboratory.**
- **SportStar's dynamic model.**
- **CANaerospace communication module.**
- **Tested peripheral modules.**
- **Matlab/Simulink control environment.**

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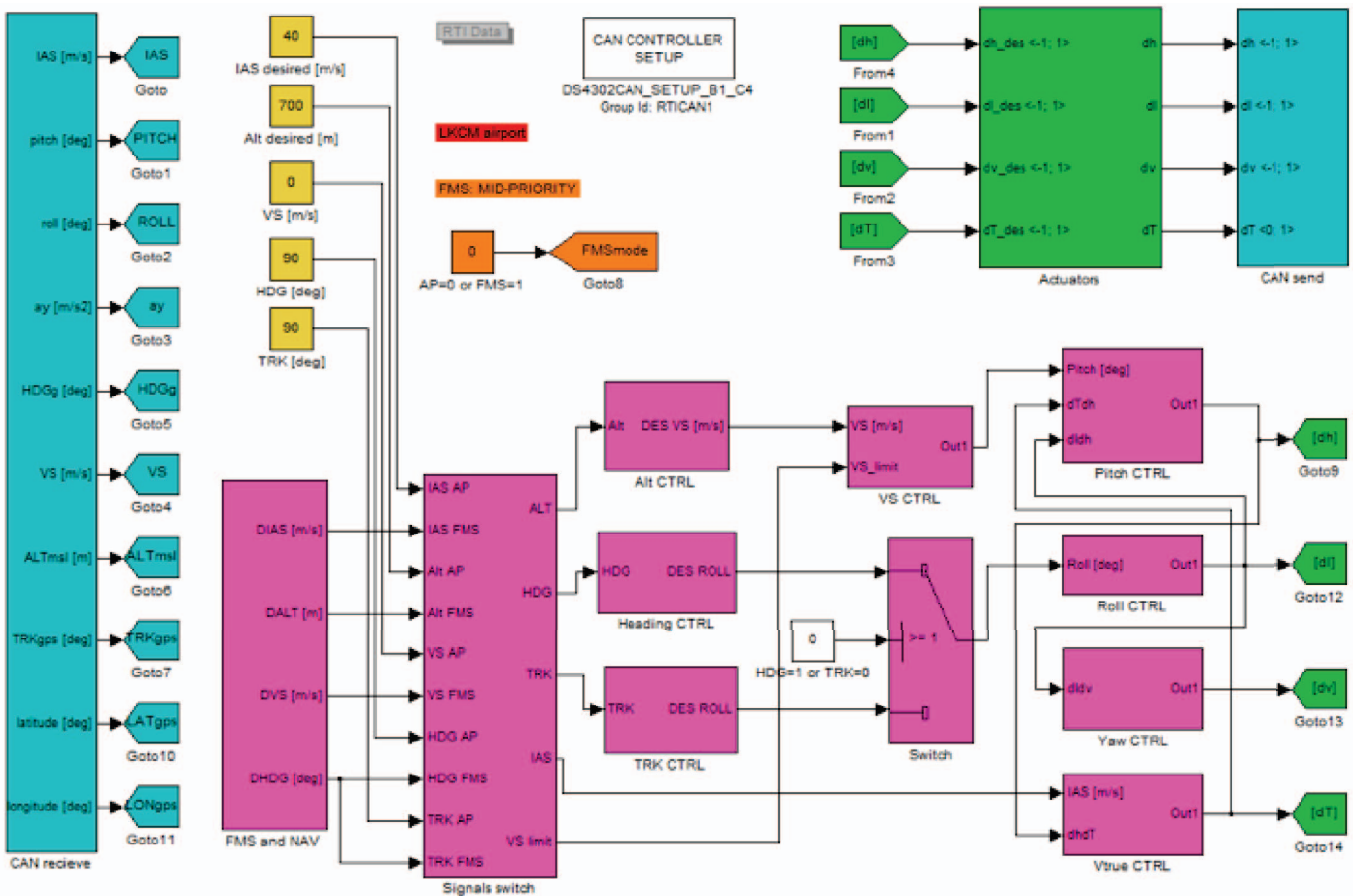
#5 Simulation and Verification



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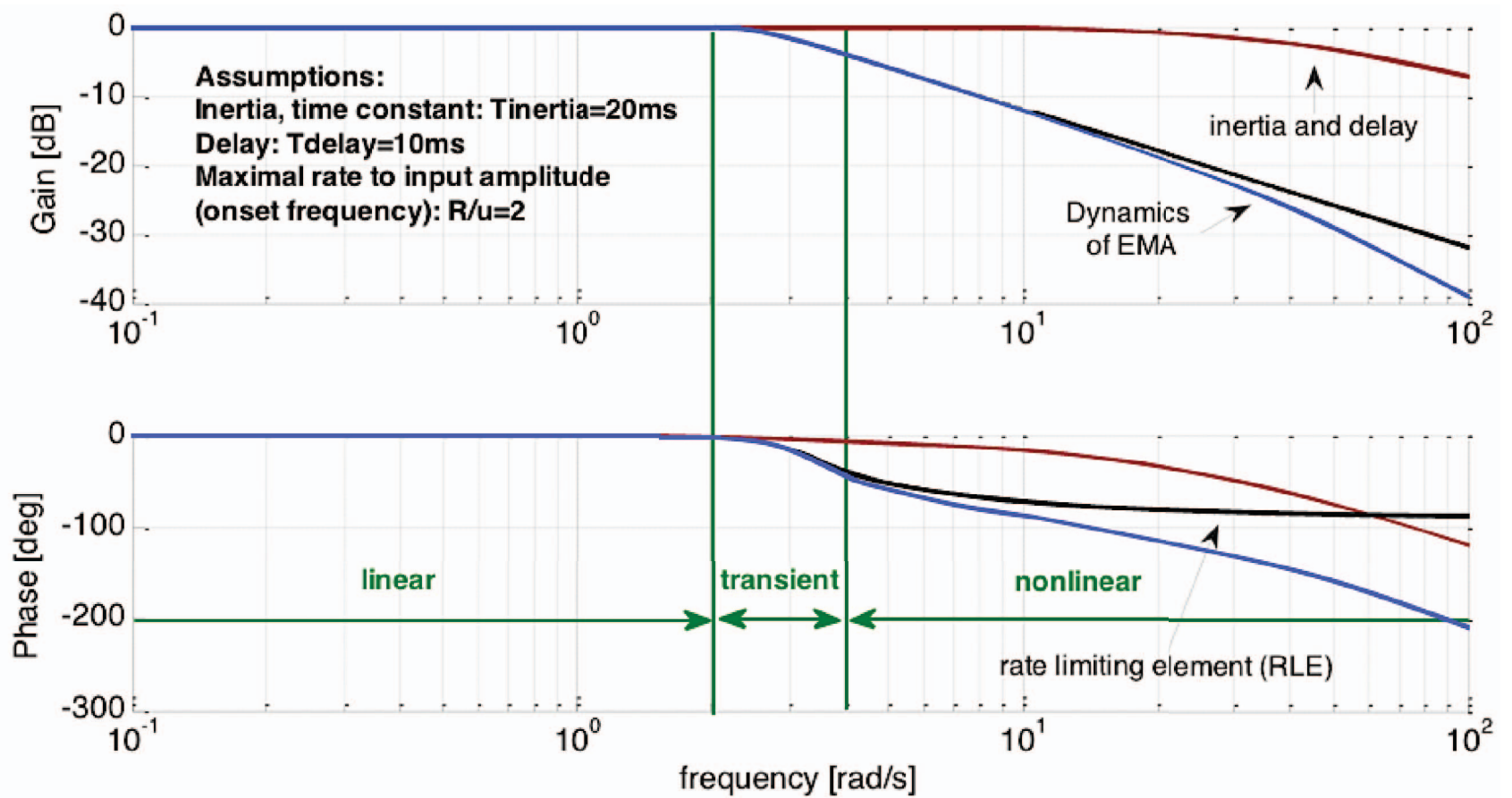
#5 Simulation and Verification



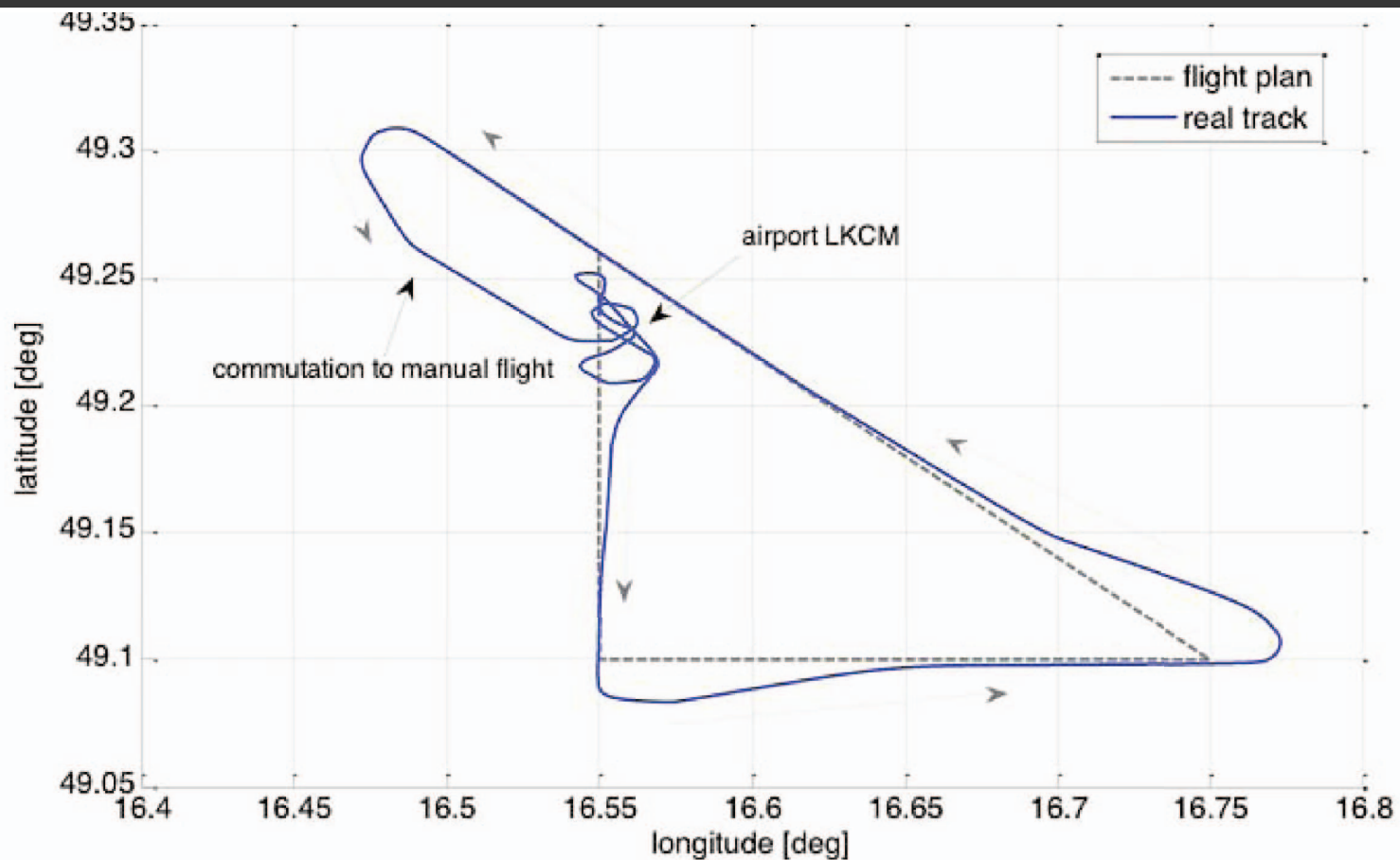
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#5 Simulation and Verification



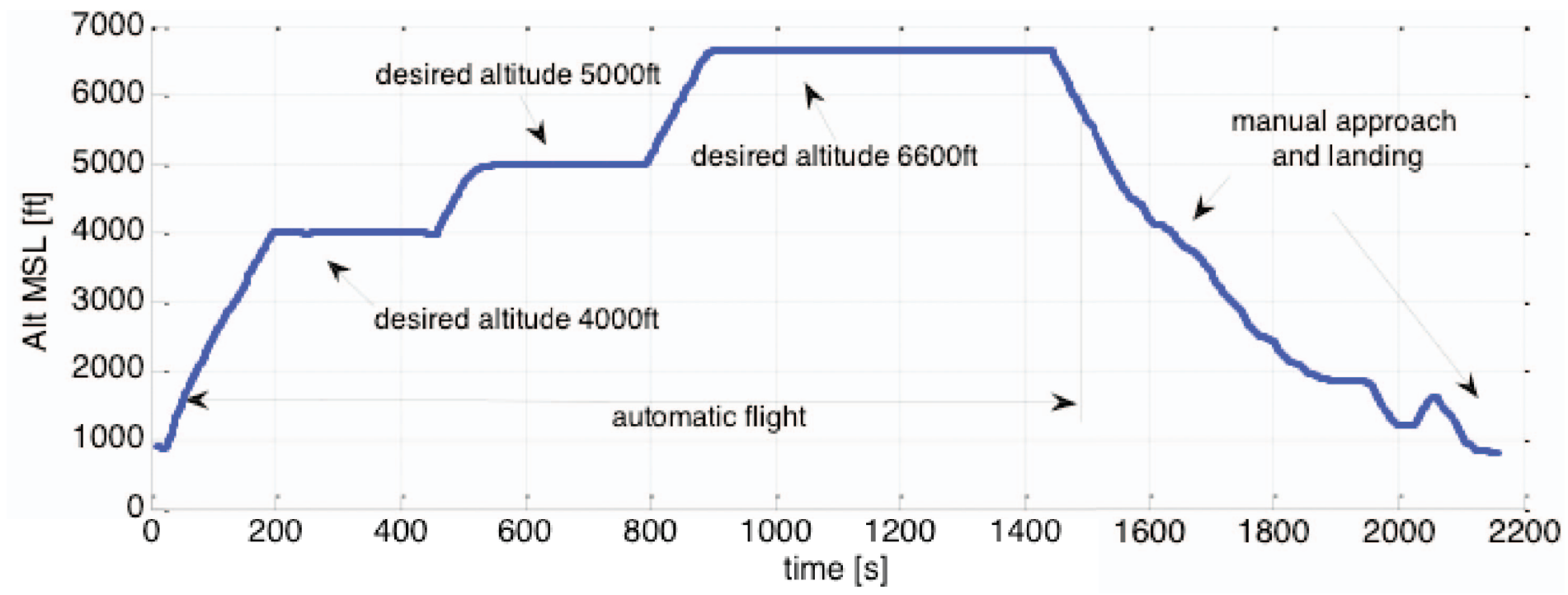
#5 Simulation and Verification



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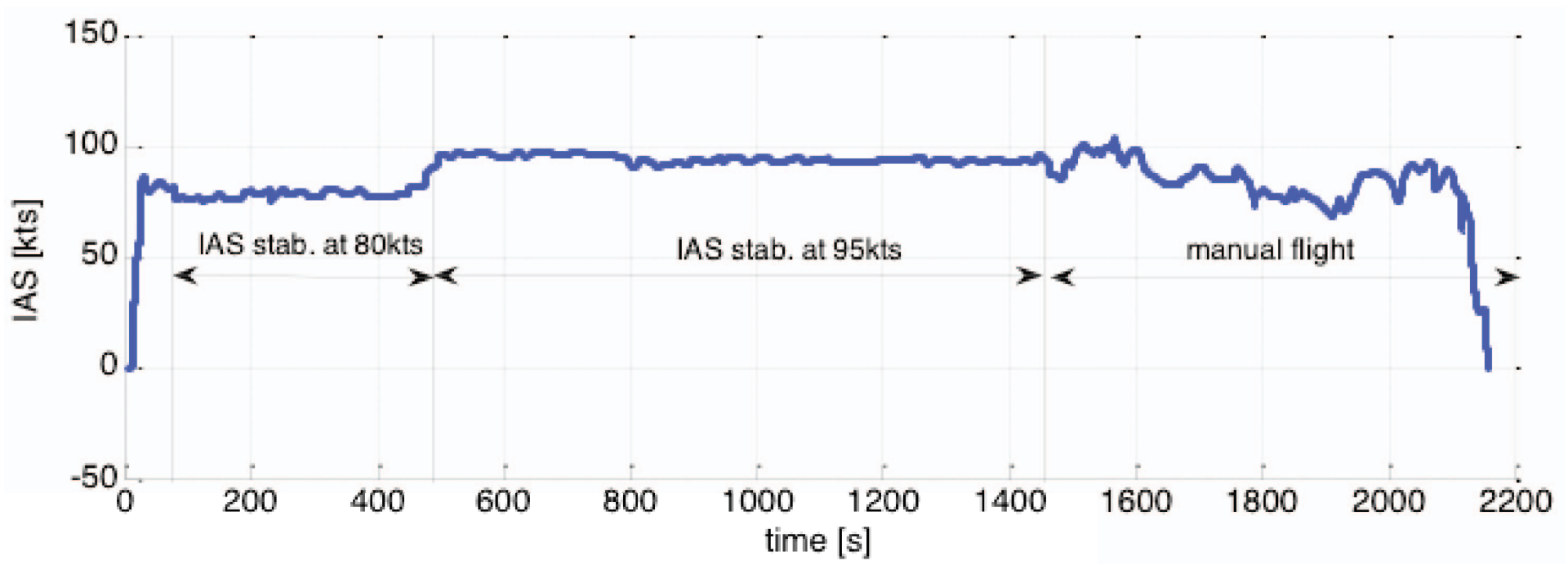
#5 Simulation and Verification



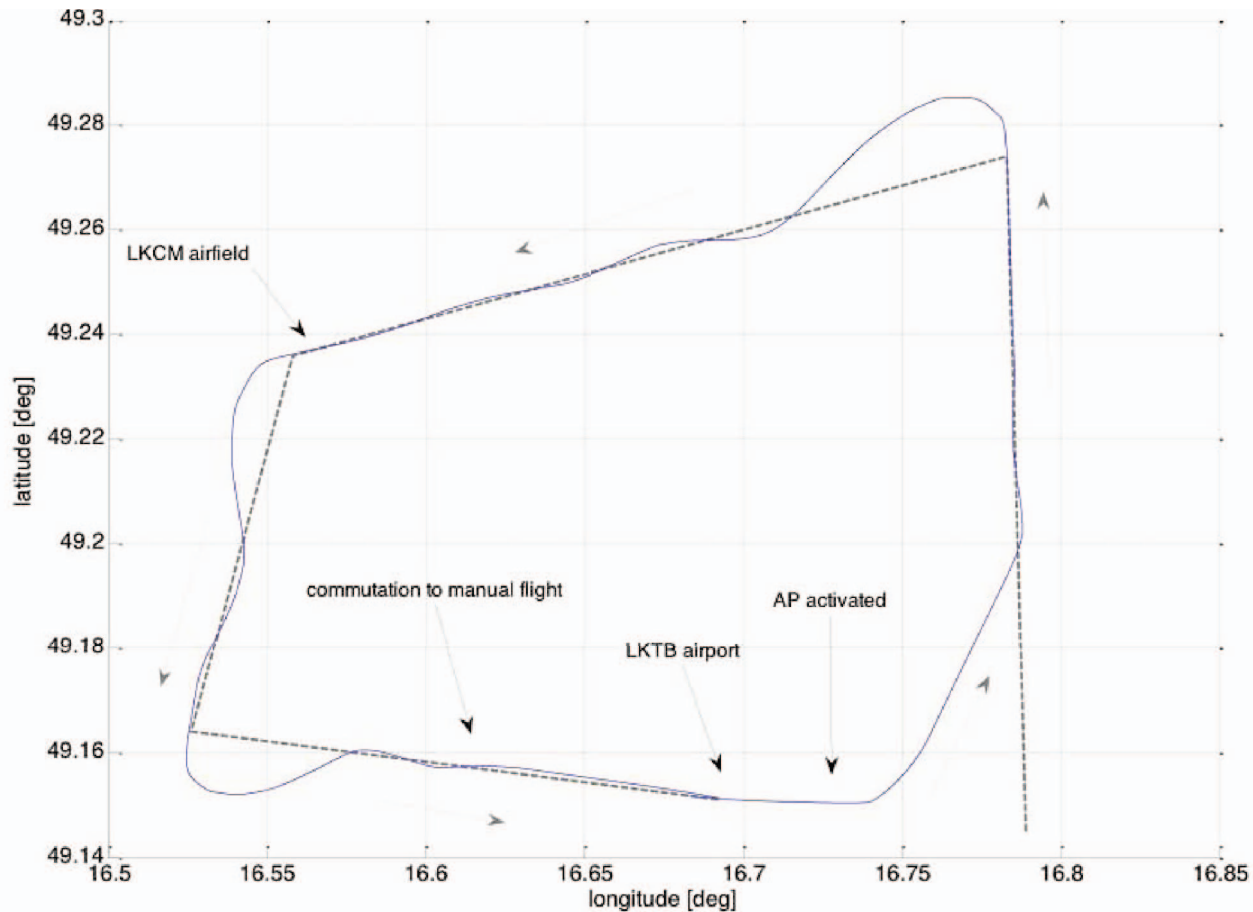
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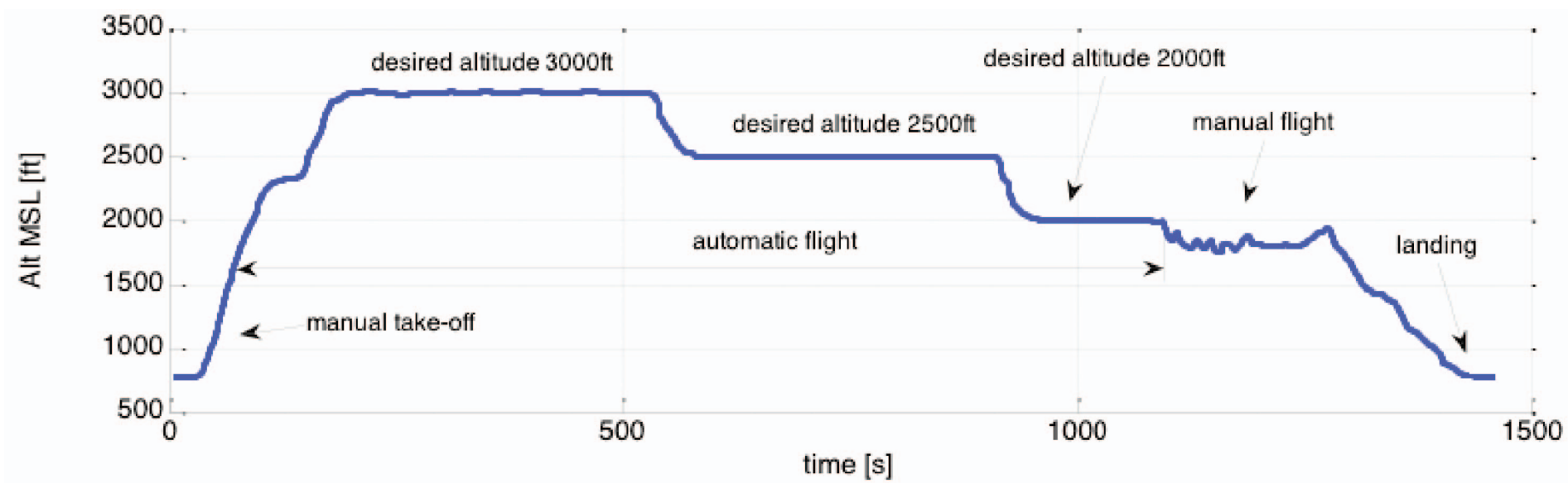
#5 Simulation and Verification



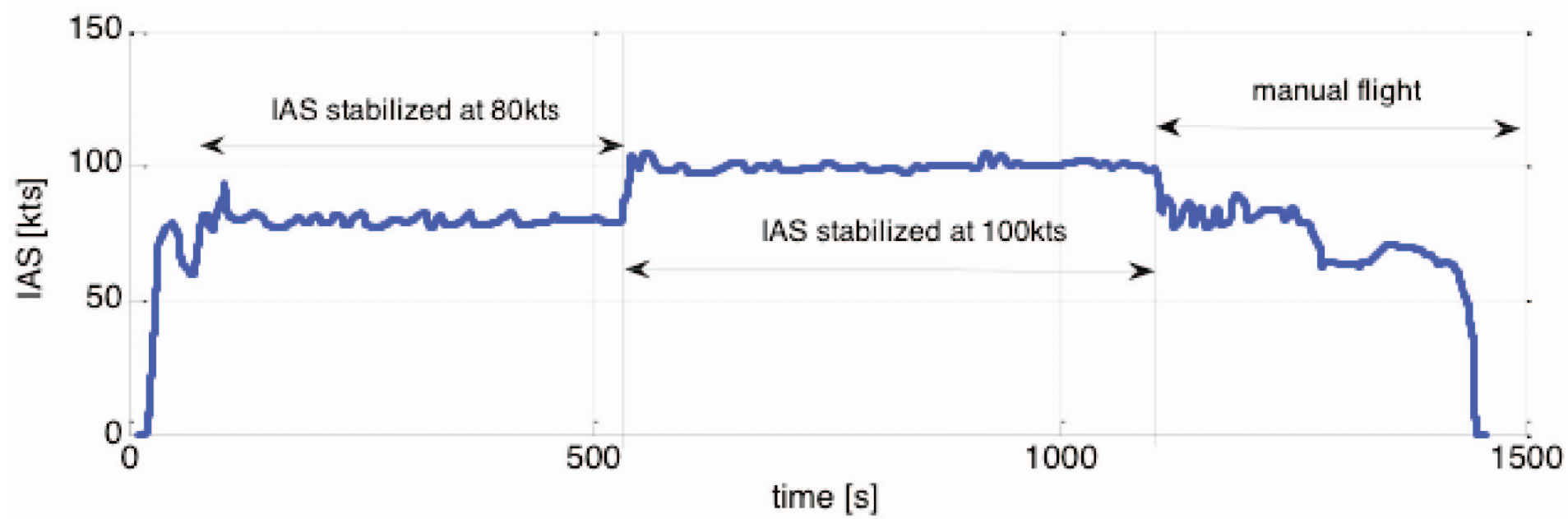
#5 Simulation and Verification



#5 Simulation and Verification



#5 Simulation and Verification



#6 Conclusion

- **Preliminary SIL simulation is confirmed by HIL.**
- **Testing scenario was based on typical flight operations of this category of aircraft.**
- **Integration of Control Scheme with Peripheral systems has been verified.**
- **Simulation framework enables continuous support from testing of first ideas to HIL simulation.**

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Thank you for your attention!