# Semestral work

# SRL – Flight management system

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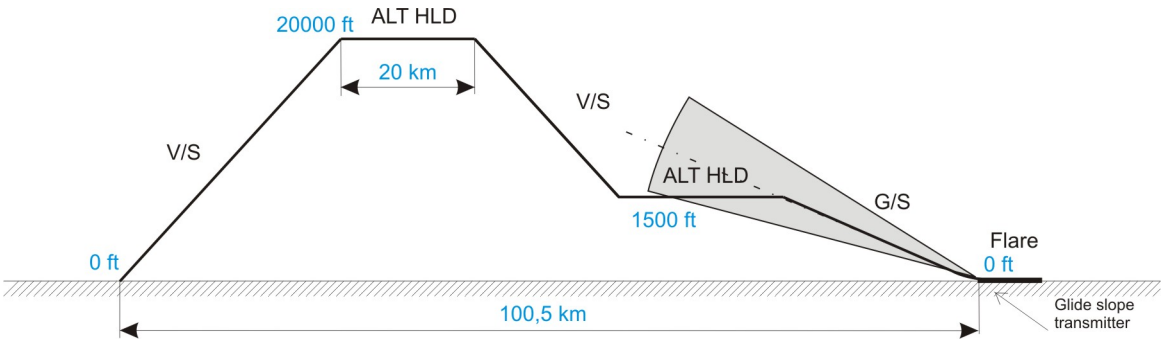
## Longitudinal part (4 modes)

Design the system with using longitudinal motion of aircraft.

- ***Vertical speed control system***, which changes altitude from **0 ft** to **20 000 ft** (pitch angle saturation **10°**)
- ***Hold altitude control system***, **10 NM**
- Change altitude to **1500 ft** (***Vertical speed control system***)
- Waiting for capture of beam from glide slope transmitter
- ***Control of angular deviation*** from glide path; angle of glide path is **3°**
- **50 ft** above the ground aircraft begins the automatic ***flare***

All longitudinal systems have air-speed stabilization.

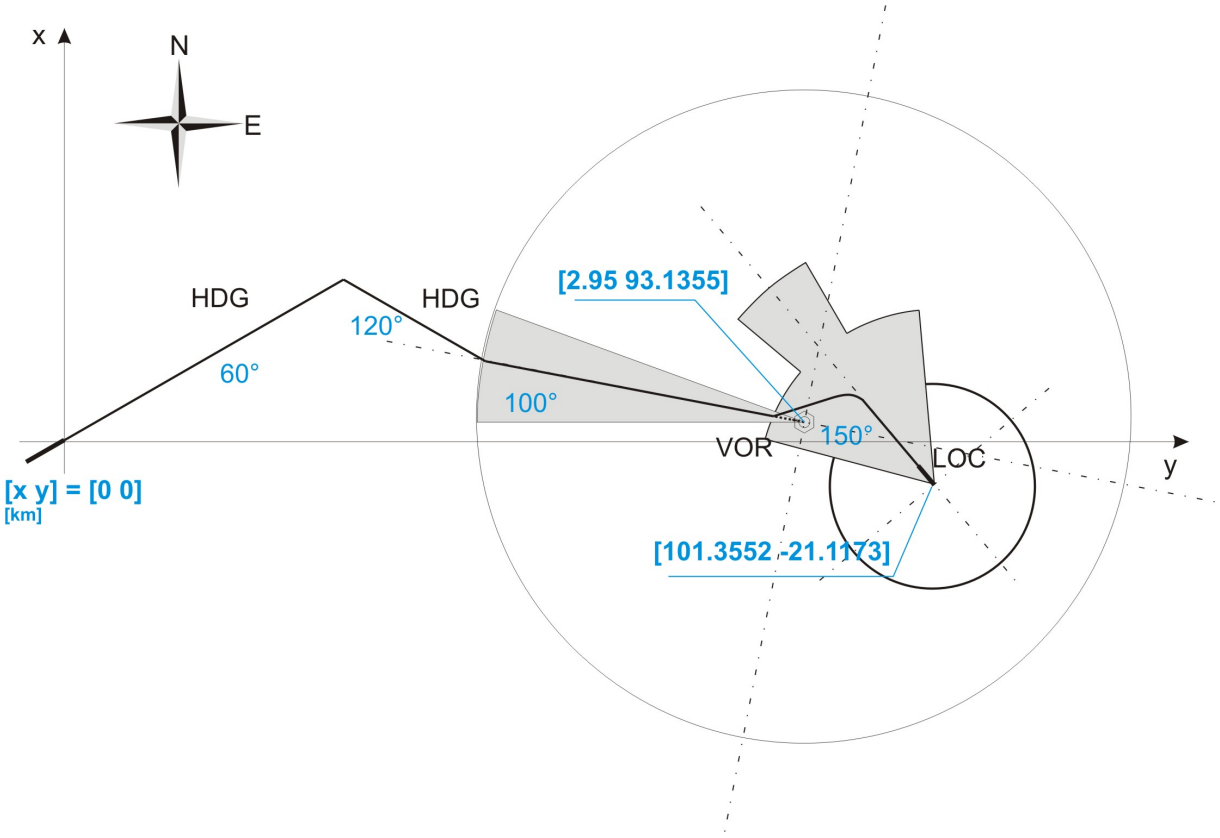



*Vertical situation*

## Lateral part (3 modes)

Design the system with using lateral motion of aircraft.

- Initial aircraft heading is 60°; fly **10 km** with ***control yaw angle***
- Turn to the heading **120°** - ***control yaw angle*** (bang angle saturation **25°**)
- ***Control with angular track deviation***; signal from VOR transmitter
- Waiting for capture of beam from localizer transmitter
- ***Final approach*** with control signal from ILS; first mode – CPT, second mode – TRC
- Heading of runway **150°**




*Horizontal situation*

## Common criteria

Several modes must be designed with respect to wind disturbance. It means that the control system can stabilize disturbance and aircraft follows input request. Element of design longitudinal and lateral control are dampers and autopilots Euler angles.

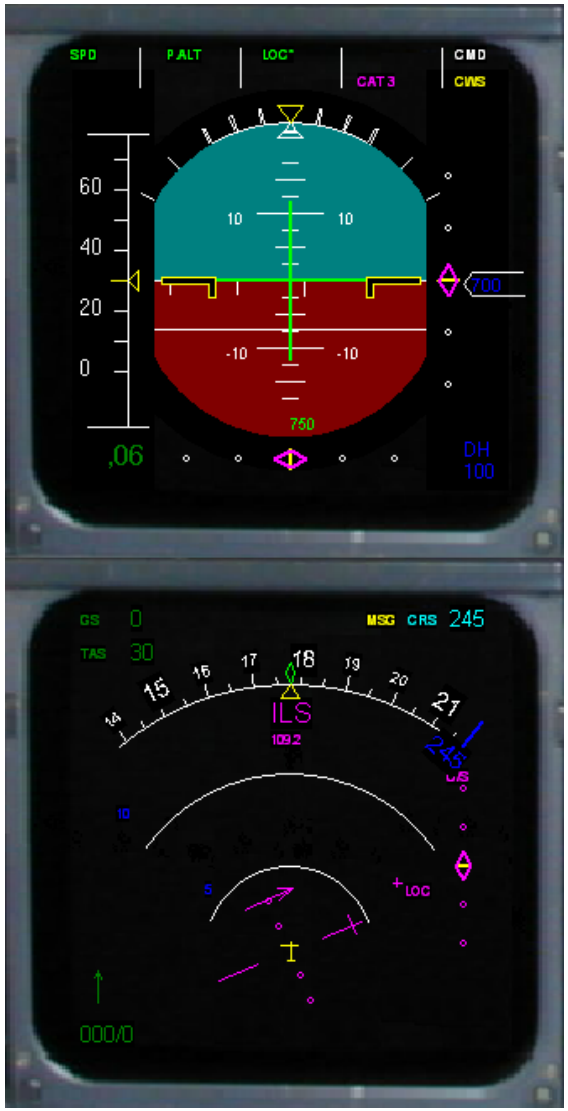
Switching between modes of control is without overshoot. („windup" problem in PID regulator)

For signal generation s of VOR and ILS radio-navigation systems is used flight&dynamics control toolbox.

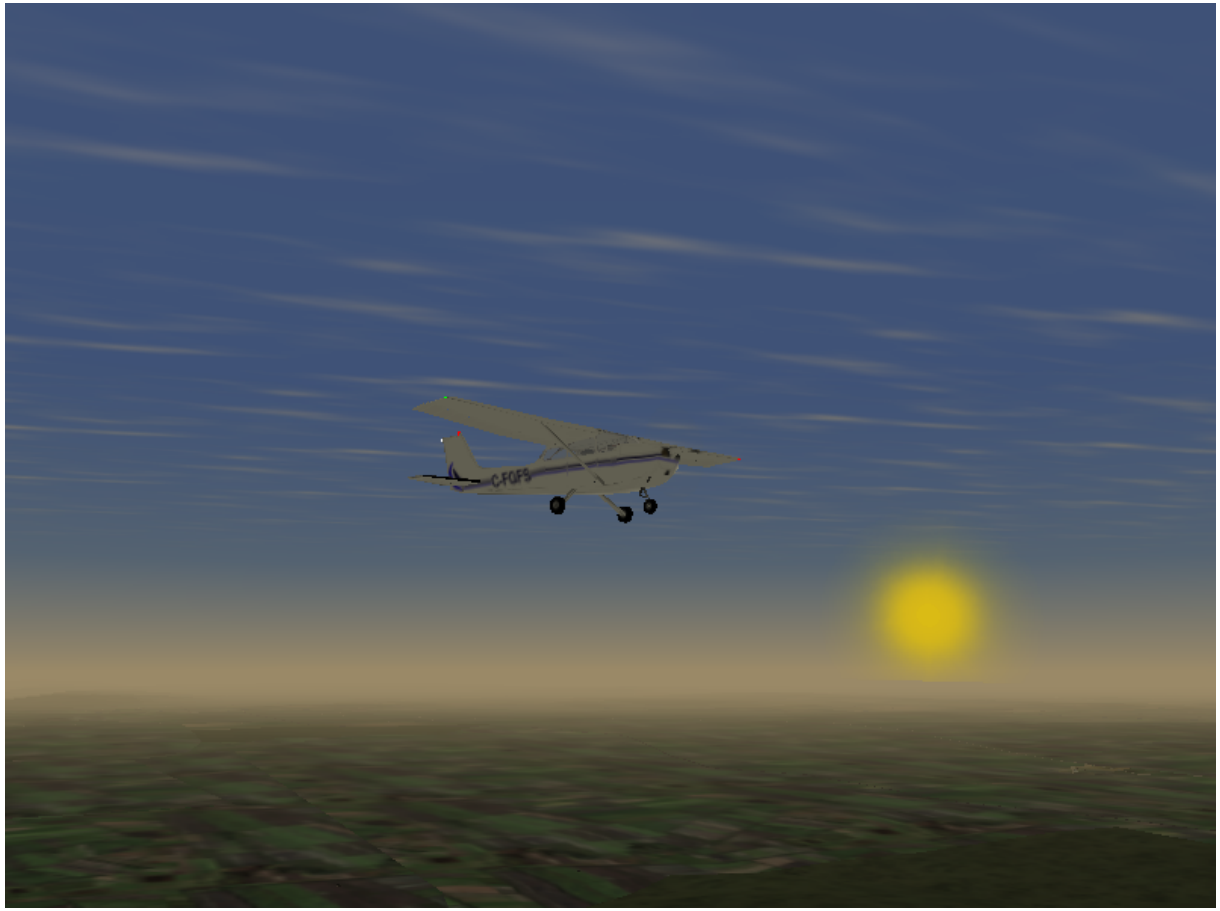
Resulting model will be configured in Simulink. In Simulink model there will be only one state-space aircraft model and for that will be switched modes of control.

**Extras:**

It is possible to simulate aircrafts motion in FlightGear simulator (interface in aerosim toolbox) and then it is possible to use digital EFIS display.




*EFIS in ILS modes*



*Display with using FlightGear*

# References: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[9] SRL pages : www.dce.felk.cvut.cz/srl1, www.dce.felk.cvut.cz/srl2

[10] AeroSim – aerunautical simulation blockset http://www.u-dynamics.com

[11] Marc Rauw. (May 25, 2005)
FDC 1.4 – A SIMULINK Toolbox for Flight Dynamics and Control Analysis
http://www.dutchroll.com


# Addition

Thesis in reference, installation of Aerosim and FDC toolbox are saved in T:\SRL