Hypersonic Propulsion Control

Hardware Testing

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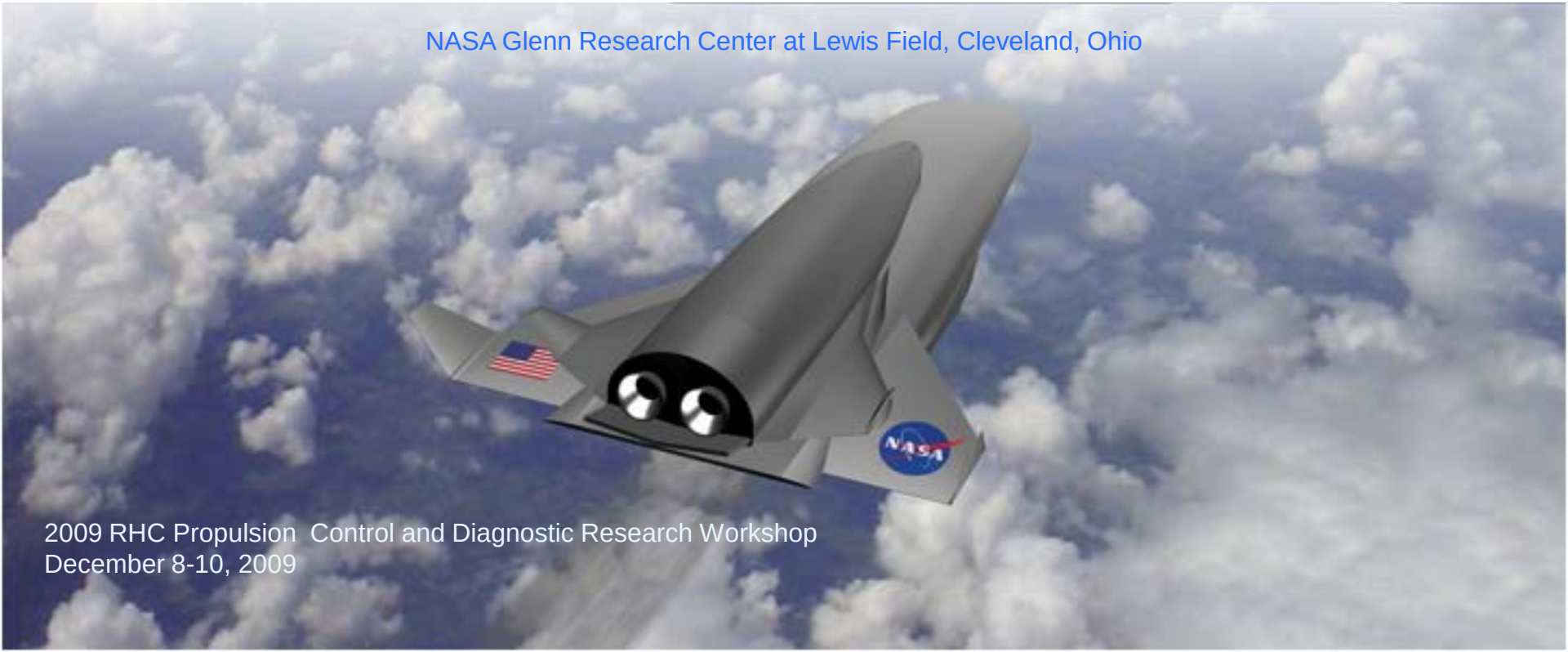
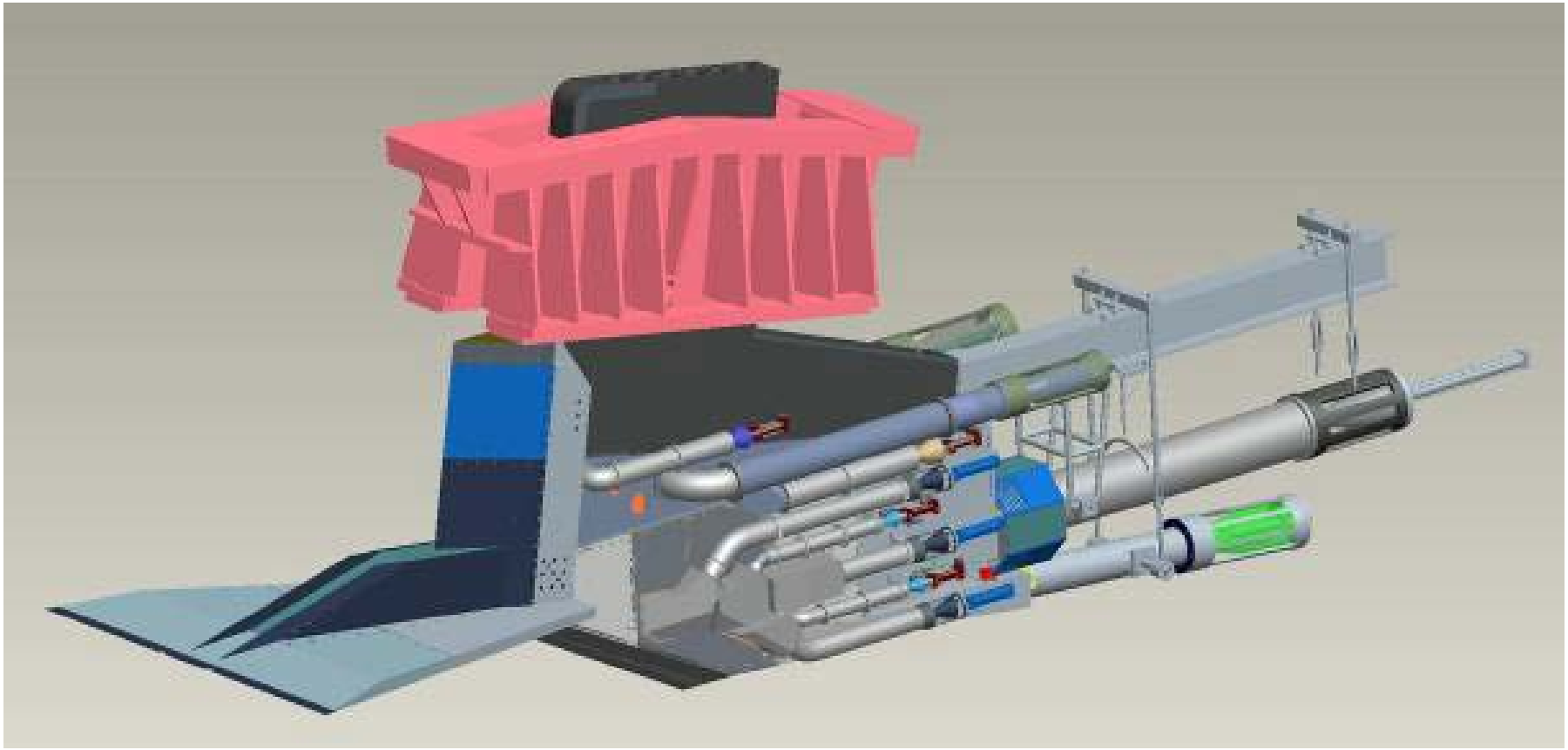


2009 RHC Propulsion Control and Diagnostic Research Workshop
December 8-10, 2009

System Identification Experiments



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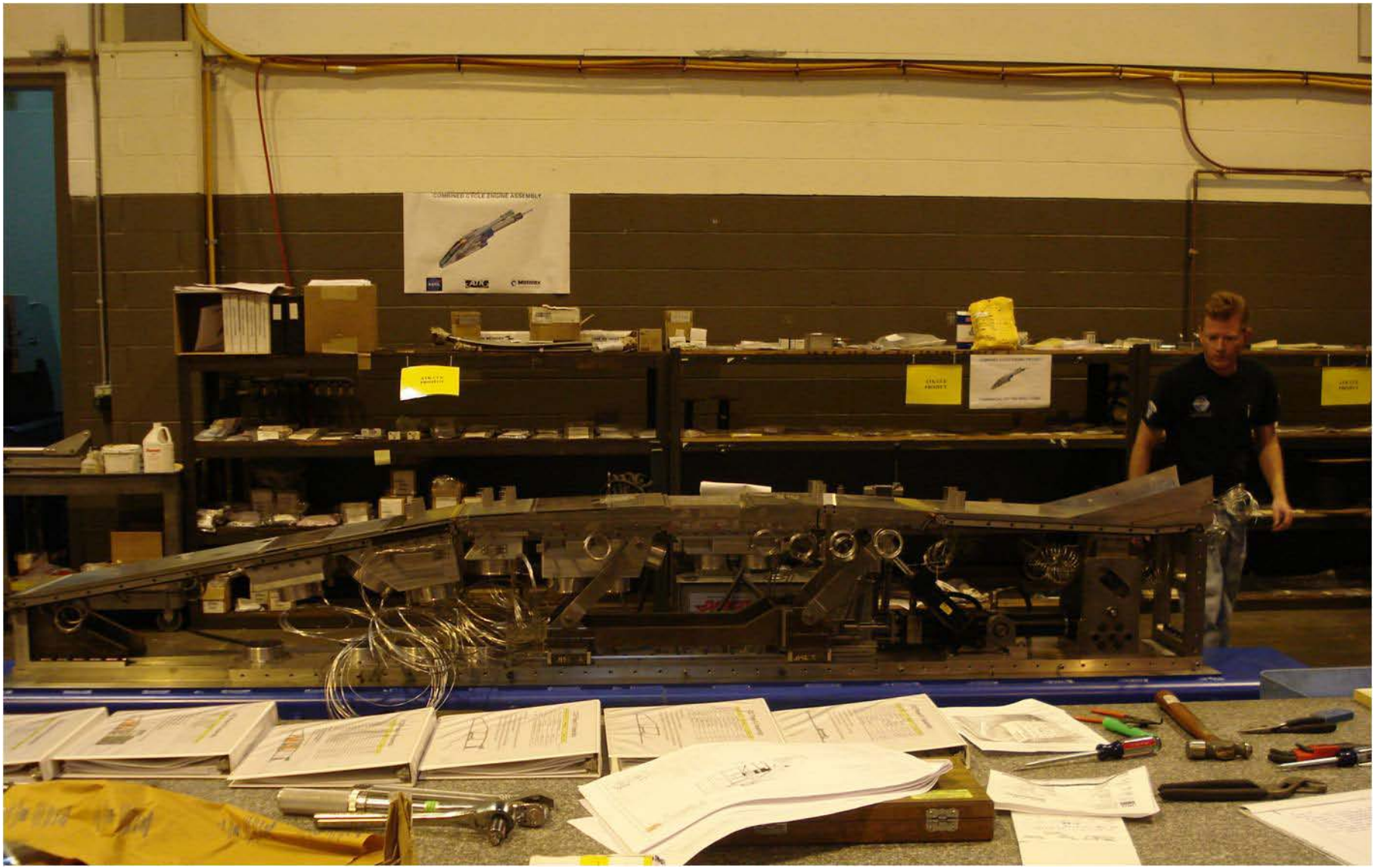

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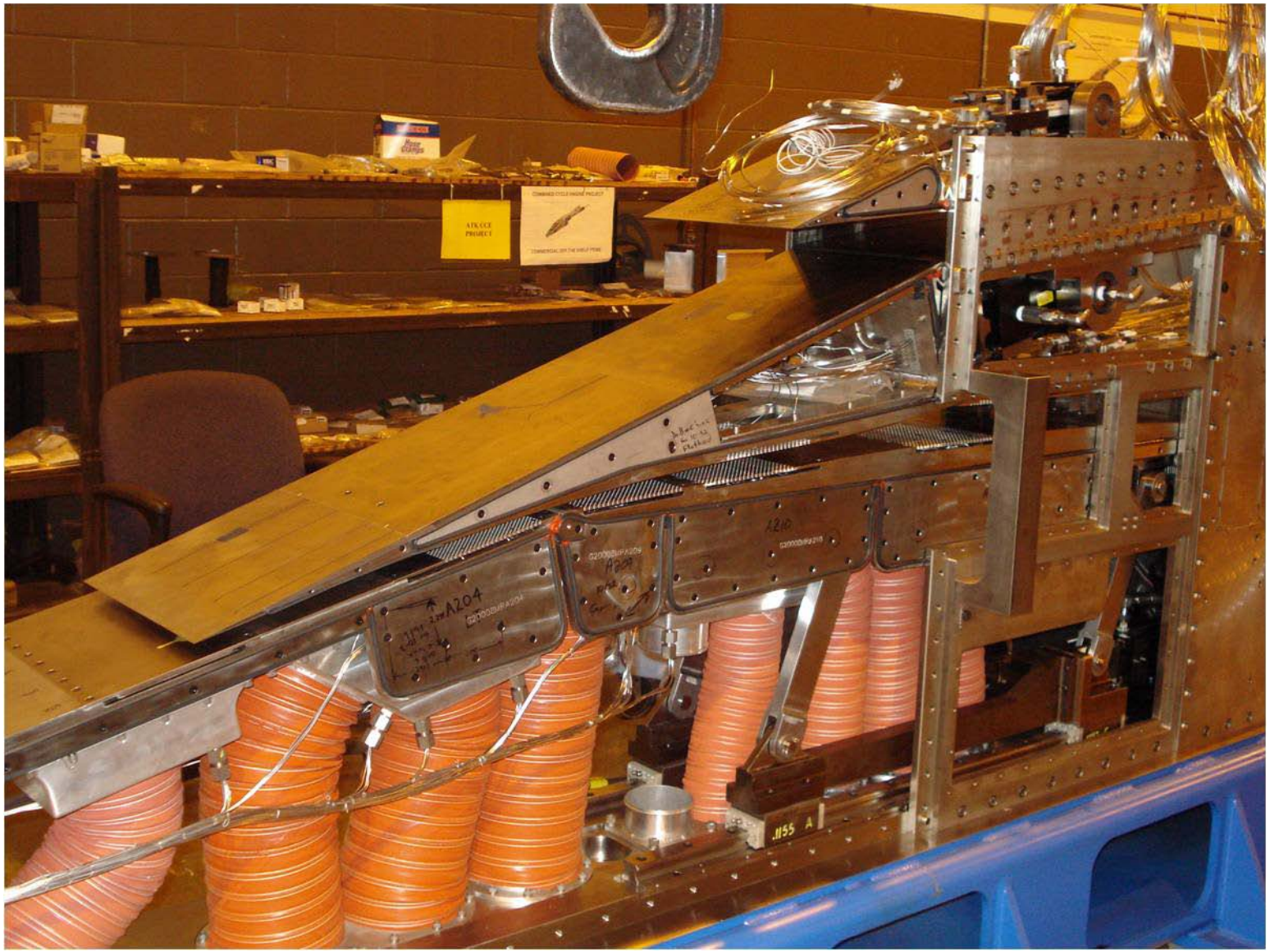

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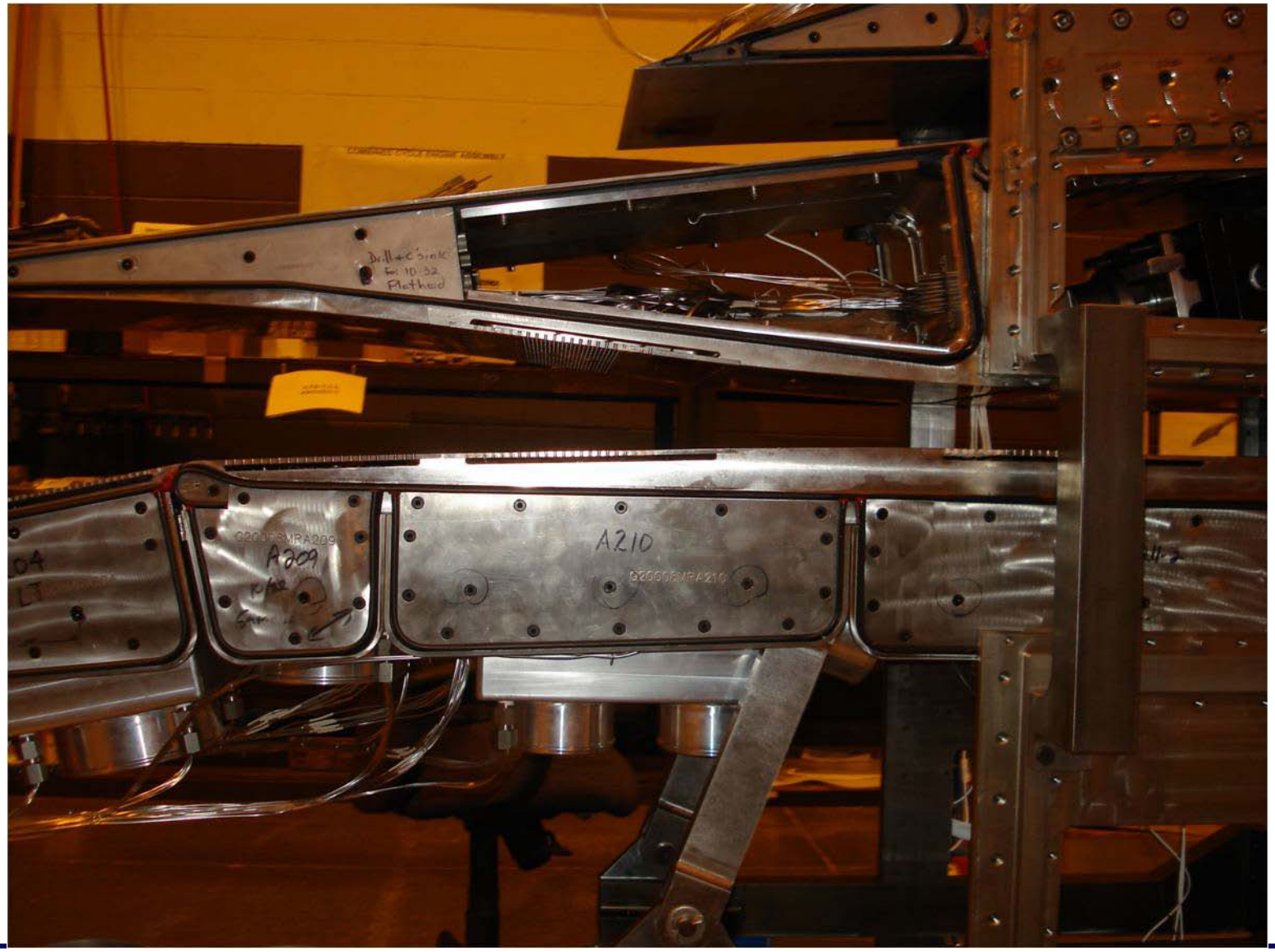

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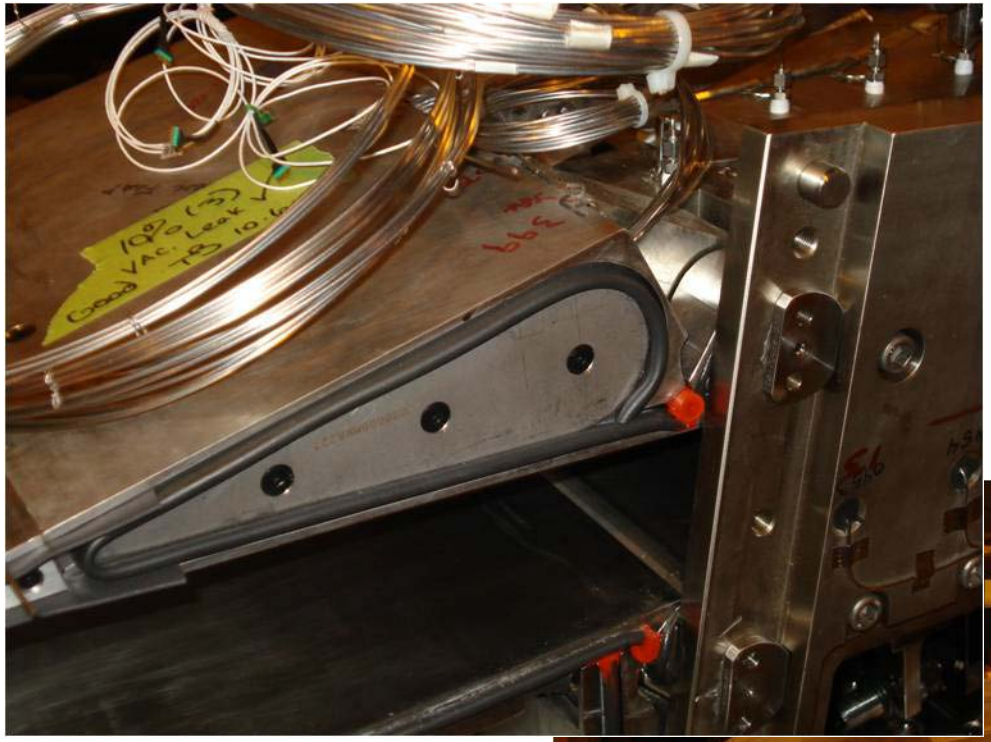

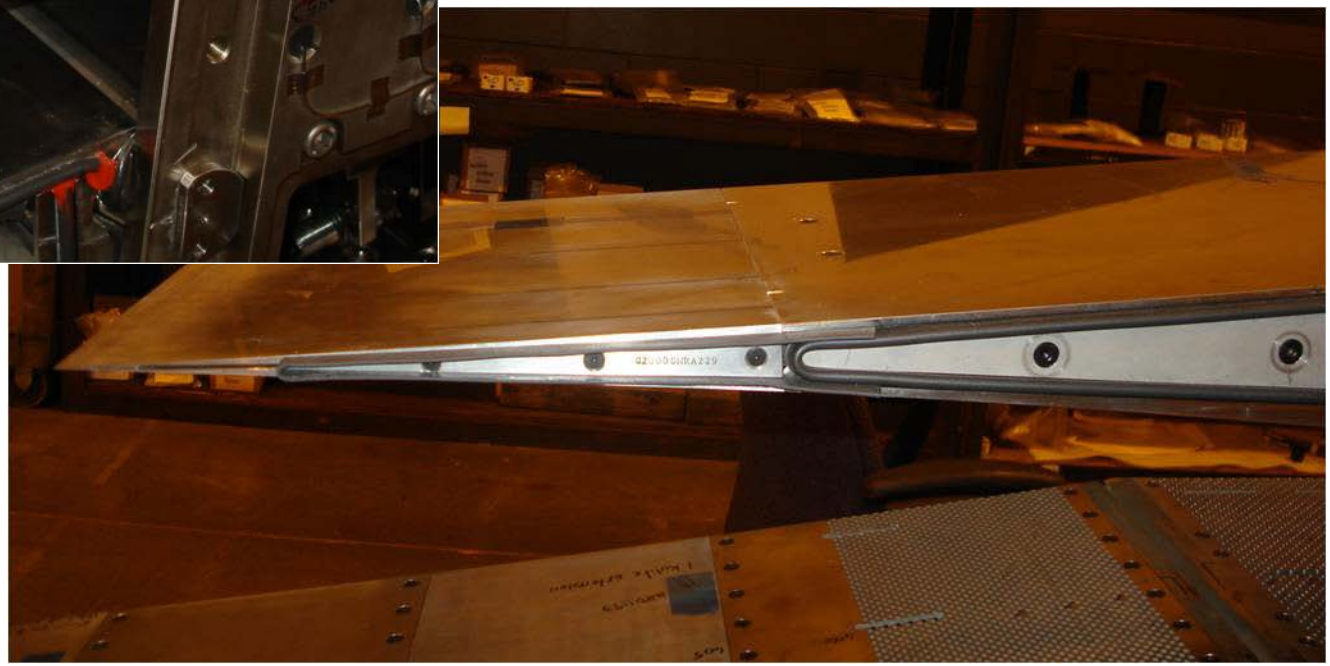

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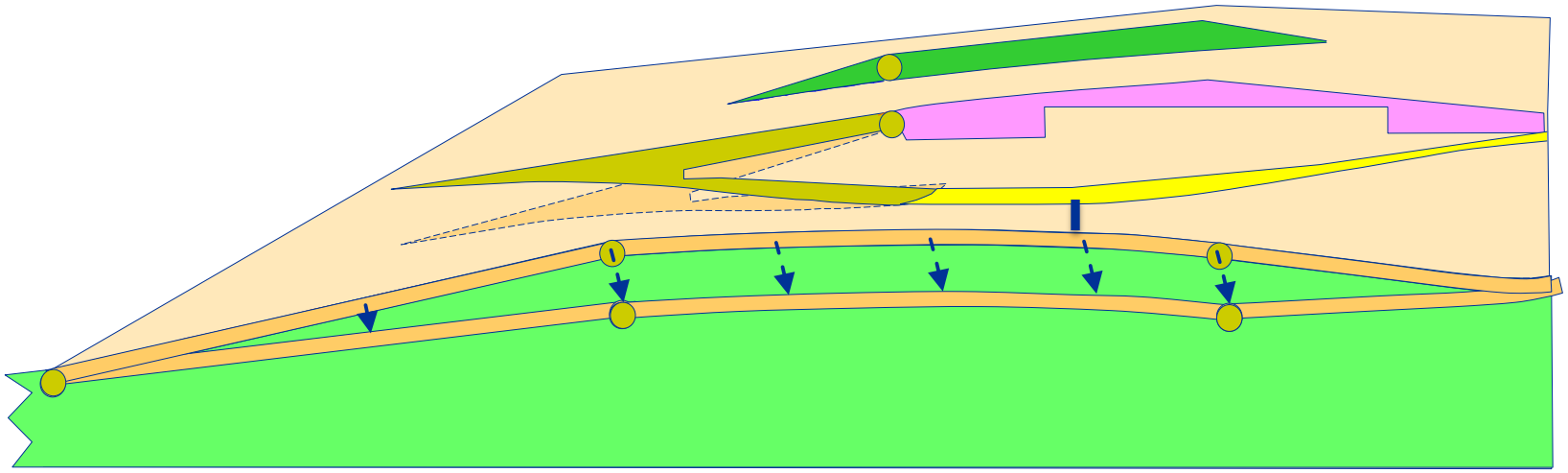

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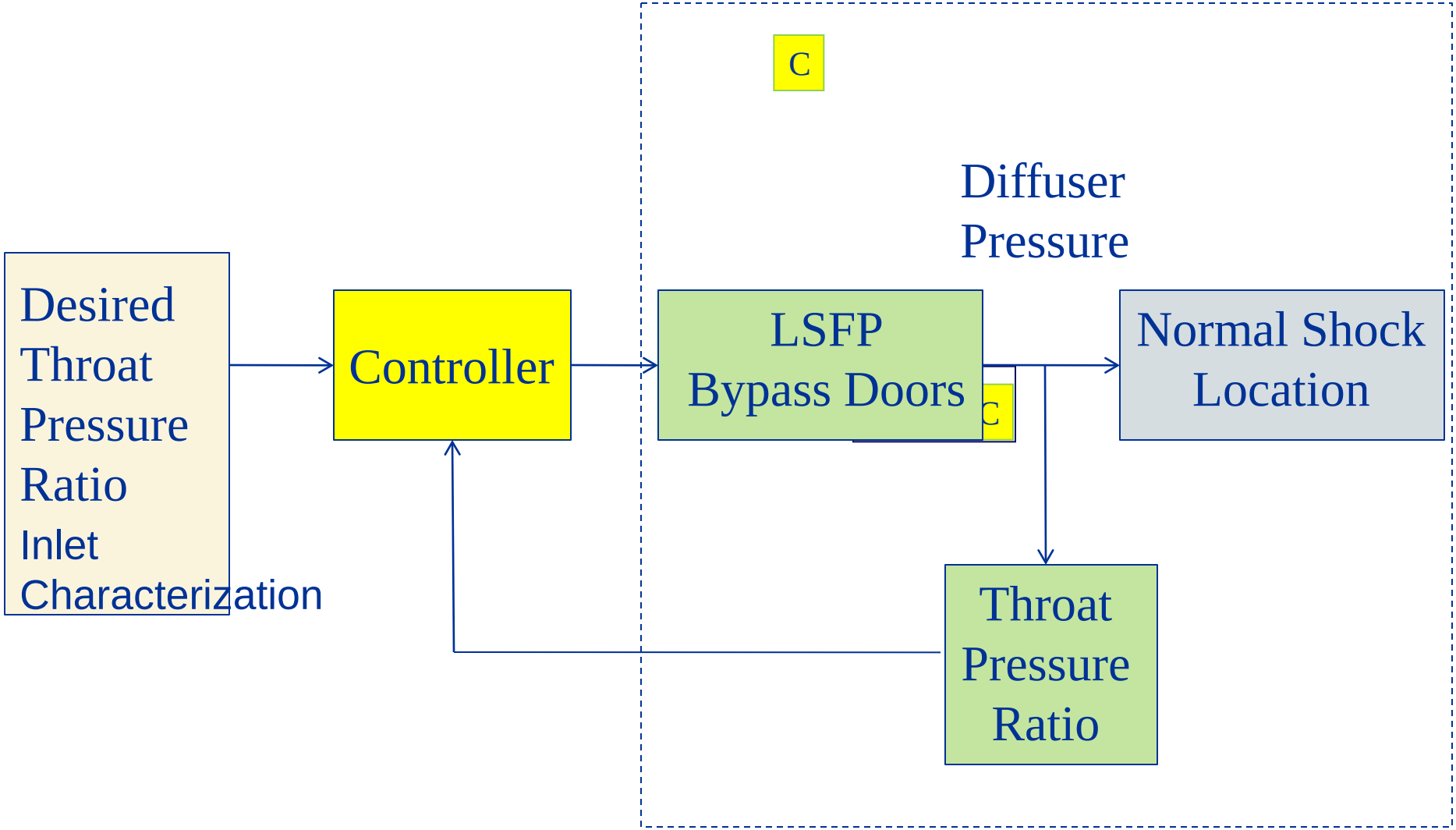

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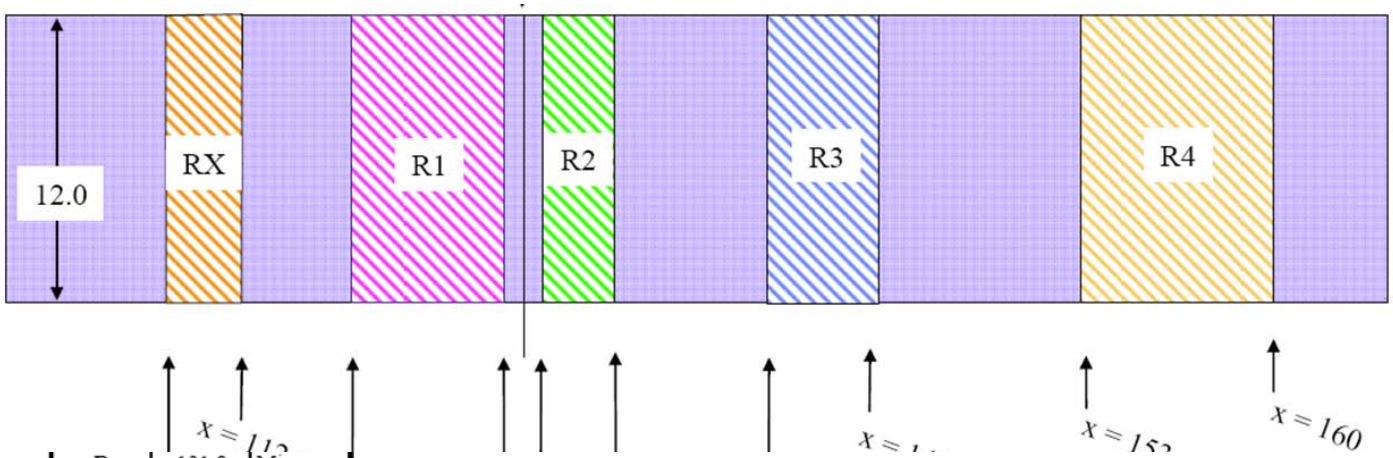
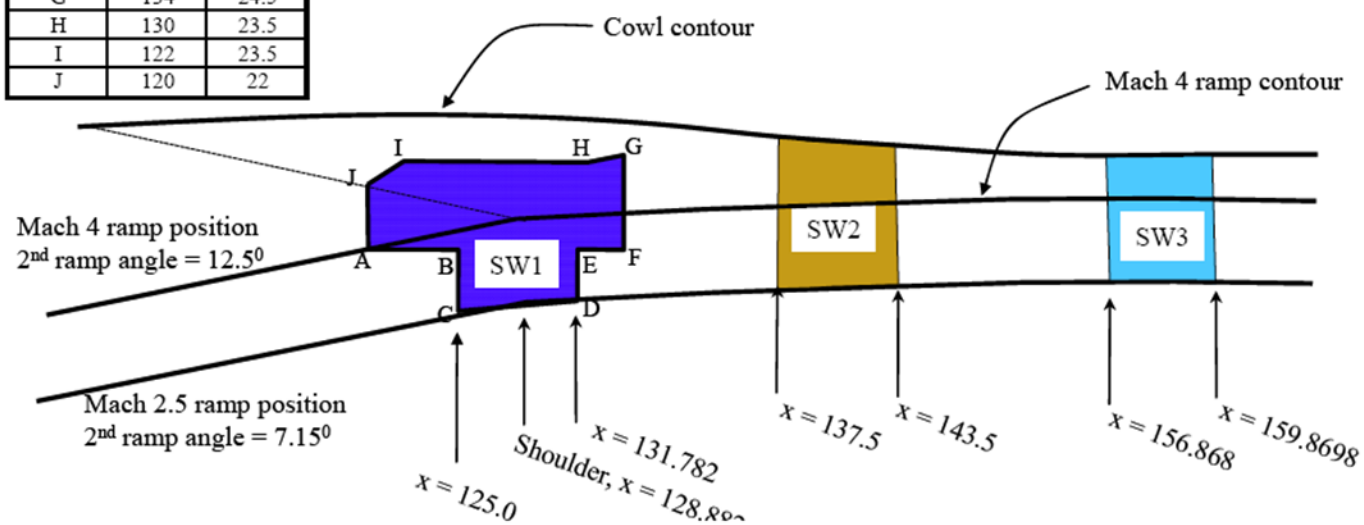


D	131.8	Min ramp
E	131.8	18
F	134	18
G	134	24.5
H	130	23.5
I	122	23.5
J	120	22

Note: 40% porosity normal hole bleed. Diameter = 0.125"

ed.



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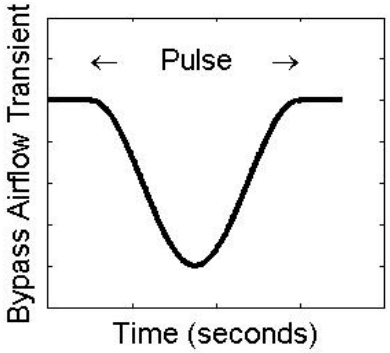
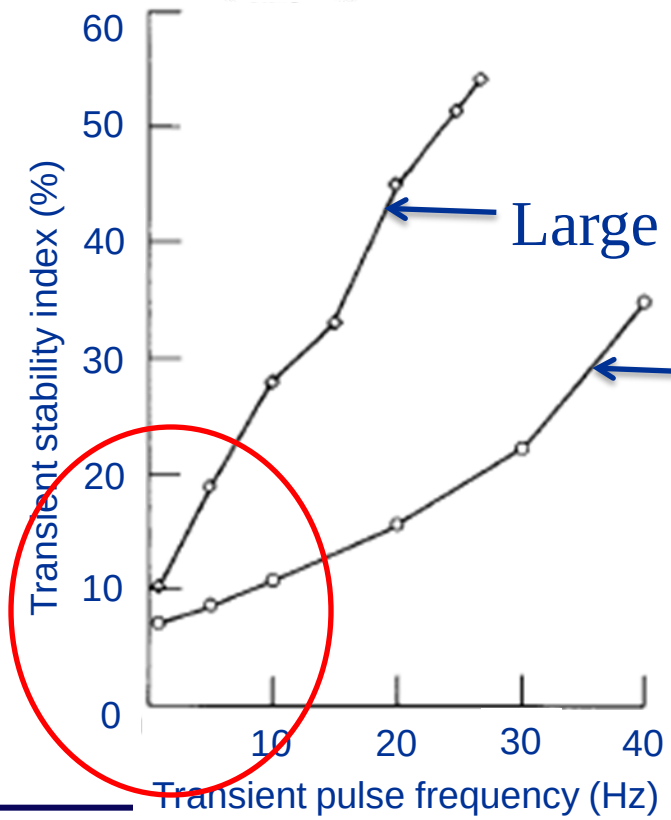


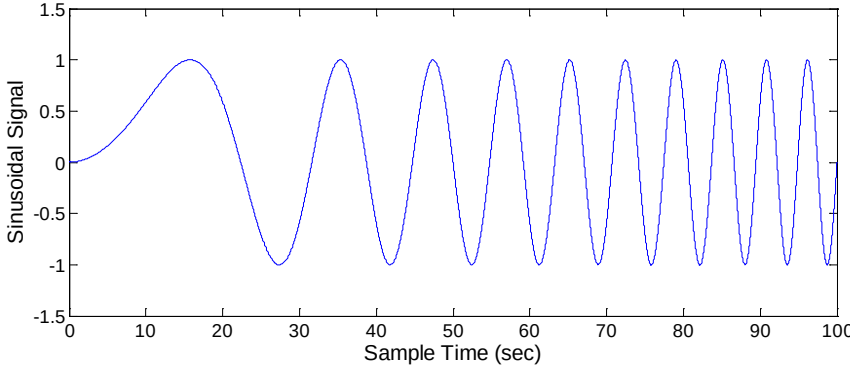
Bleed plenum volume (m^3)

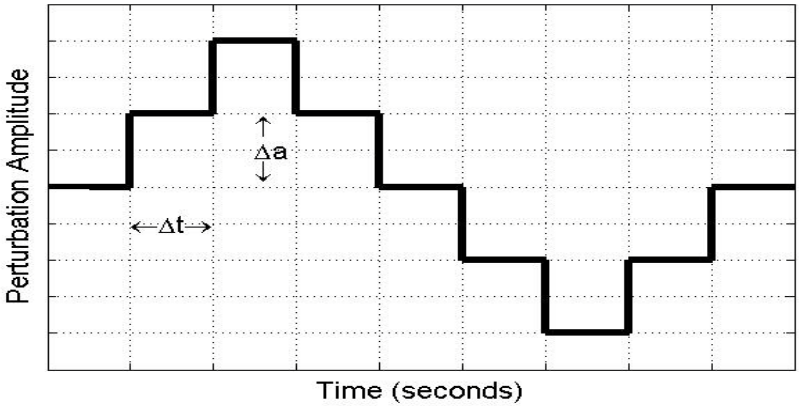
- ○ 0.0184 (small)
- ◇ 0.4020 (large)

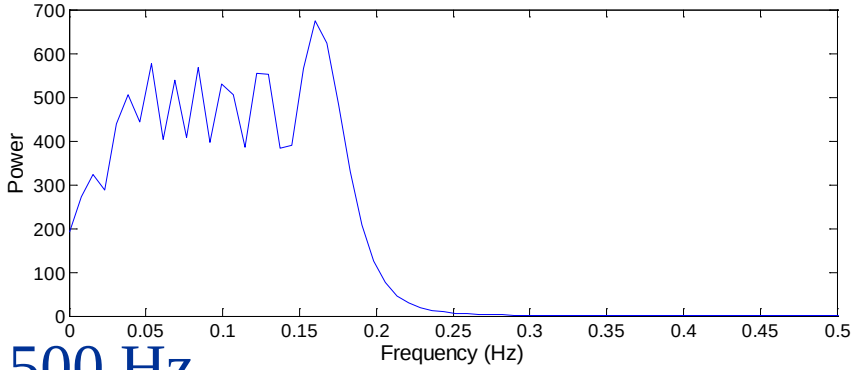


Sanders, B.W. and Mitchel G.A., "Throat-Bypass Bleed Systems for Increasing the Stable Airflow Range of a Mach 2.5 Axisymmetric Inlet with 40-Percent Internal Contraction," NASA TM X-2779, May 1973

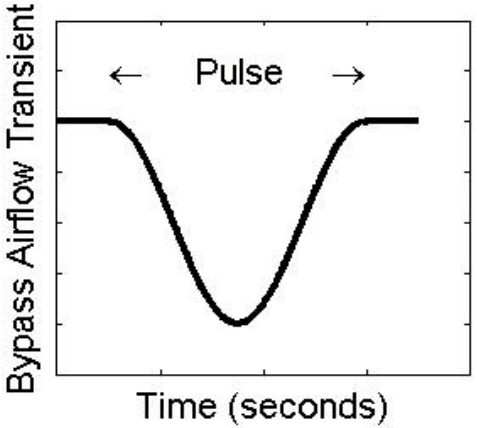
System Identification Experiments







500 Hz



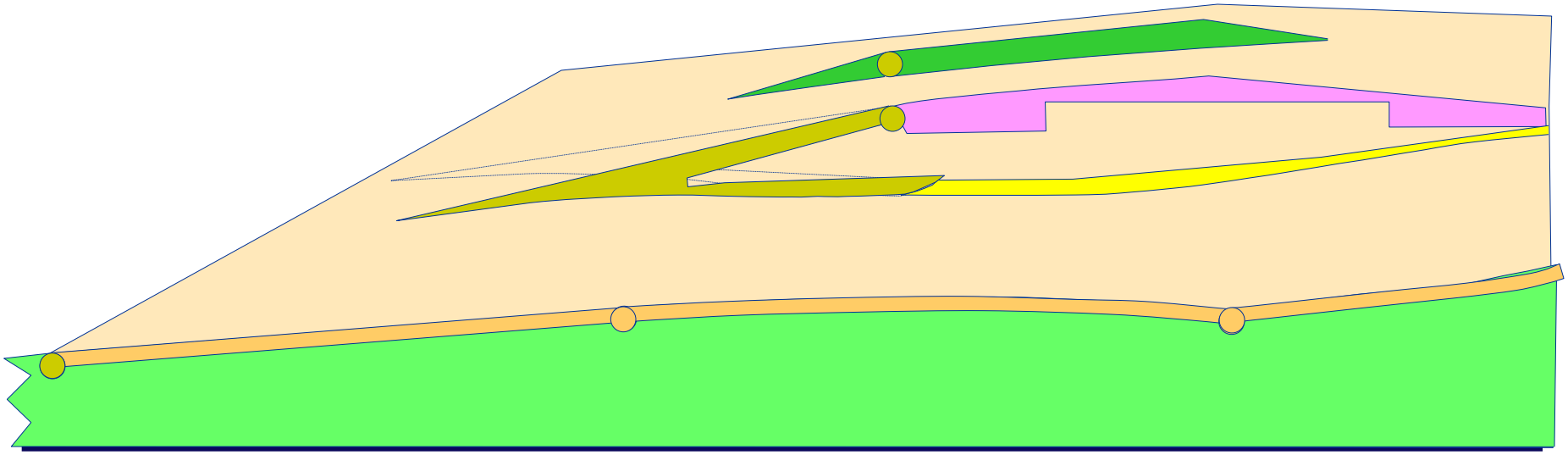
Example of a sinusoidal stimulating signal with frequency linearly ranging from 0.0 Hz to 0.2 Hz over a 100 second span.

Mode Transition Experiment

Simultaneous control of all actuators:

- HS Cowl
- Splitter
- Ramp
- Bypass Valves 1-4
- HS Cold Pipe Plug
- LS Cold Pipe Plug

M = 0.

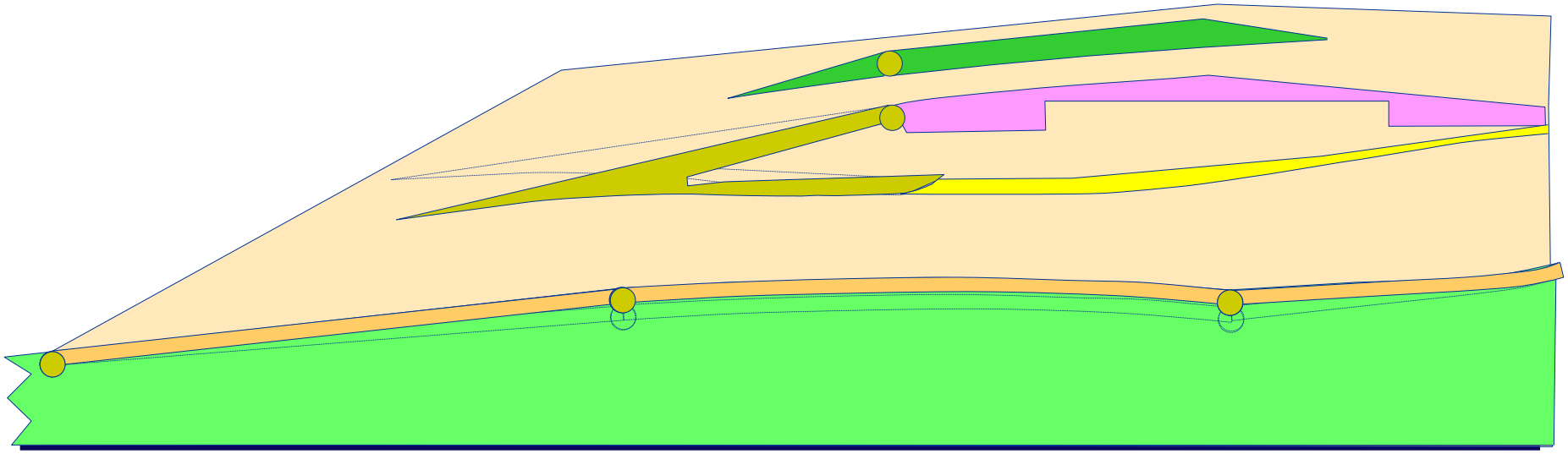


Mode Transition Experiment

Simultaneous control of all actuators:

- HS Cowl
- Splitter
- Ramp
- Bypass Valves 1-4
- HS Cold Pipe Plug
- LS Cold Pipe Plug

M = 2.

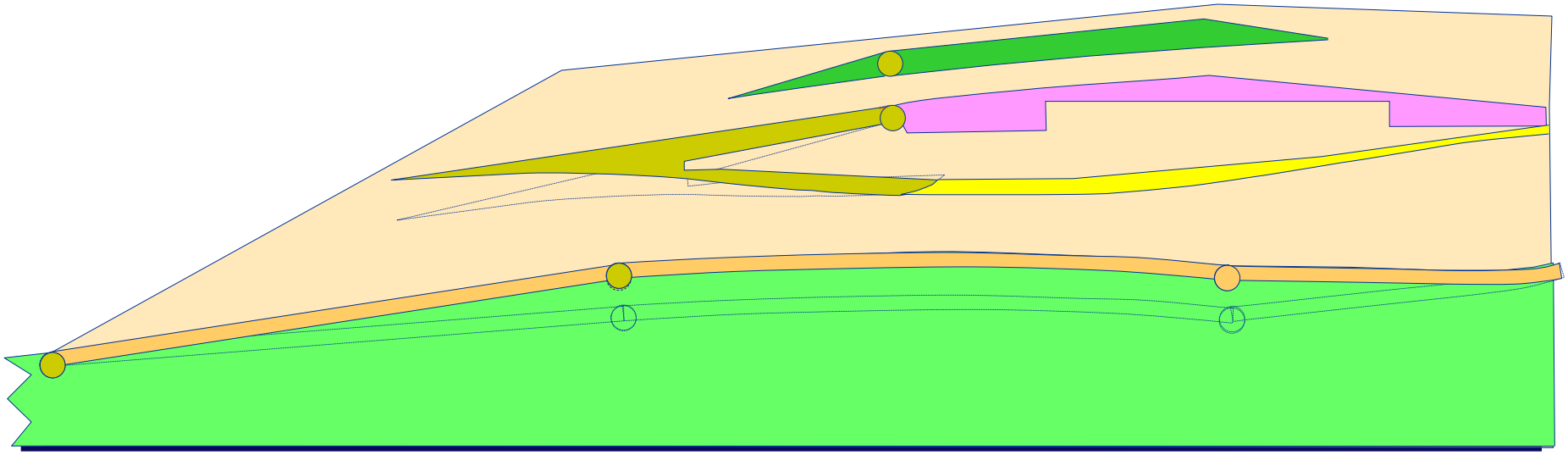


Mode Transition Experiment

Simultaneous control of all actuators:

- HS Cowl
- Splitter
- Ramp
- Bypass Valves 1-4
- HS Cold Pipe Plug
- LS Cold Pipe Plug

M = 3.



Mode Transition Experiment

Simultaneous control of all actuators:

- HS Cowl
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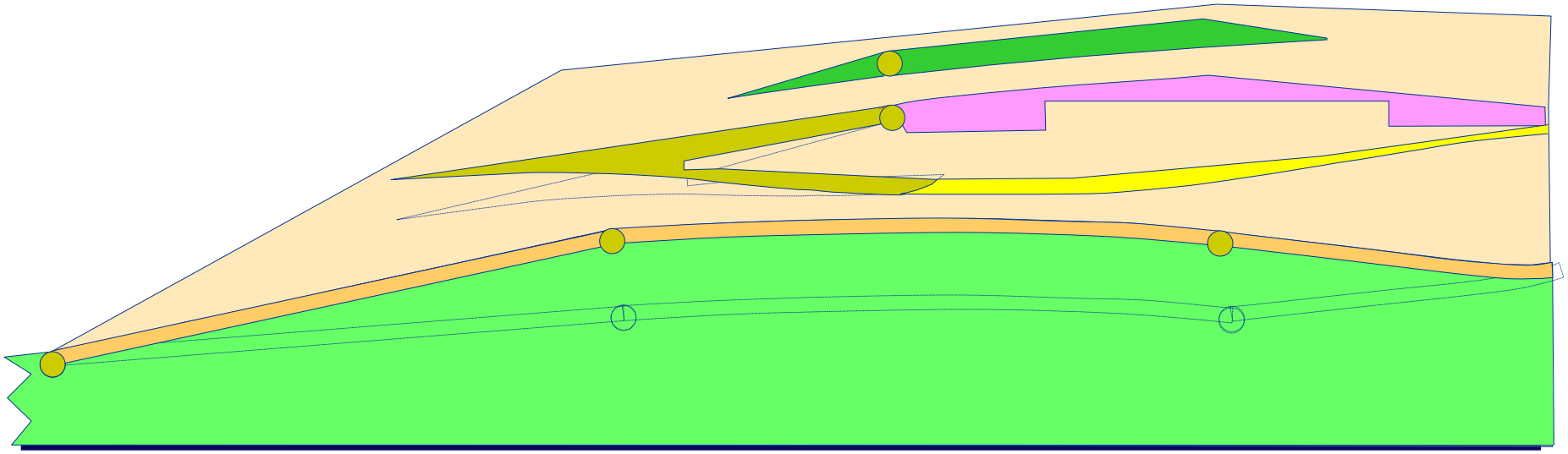
- Ramp
- Bypass Valves 1-4
- HS Cold Pipe Plug
- LS Cold Pipe Plug

M = 4.

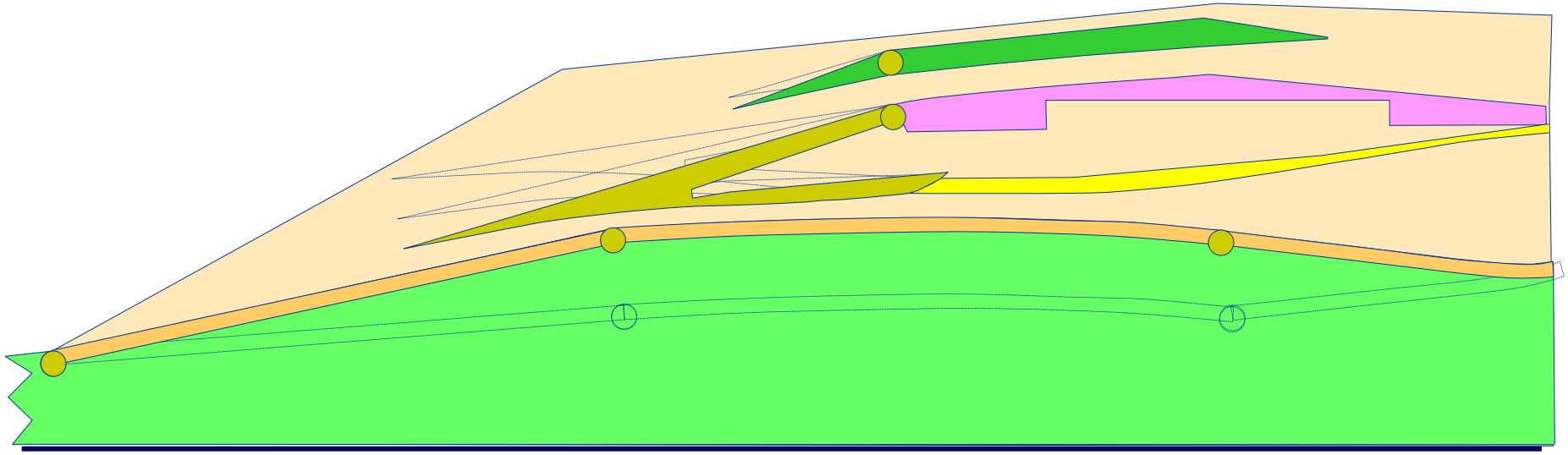


Mode Transition Experiment

Simultaneous control of all actuators:

- HS Cowl
- Splitter
- Ramp
- Bypass Valves 1-4
- HS Cold Pipe Plug
- LS Cold Pipe Plug

Mode transition at M = 4.

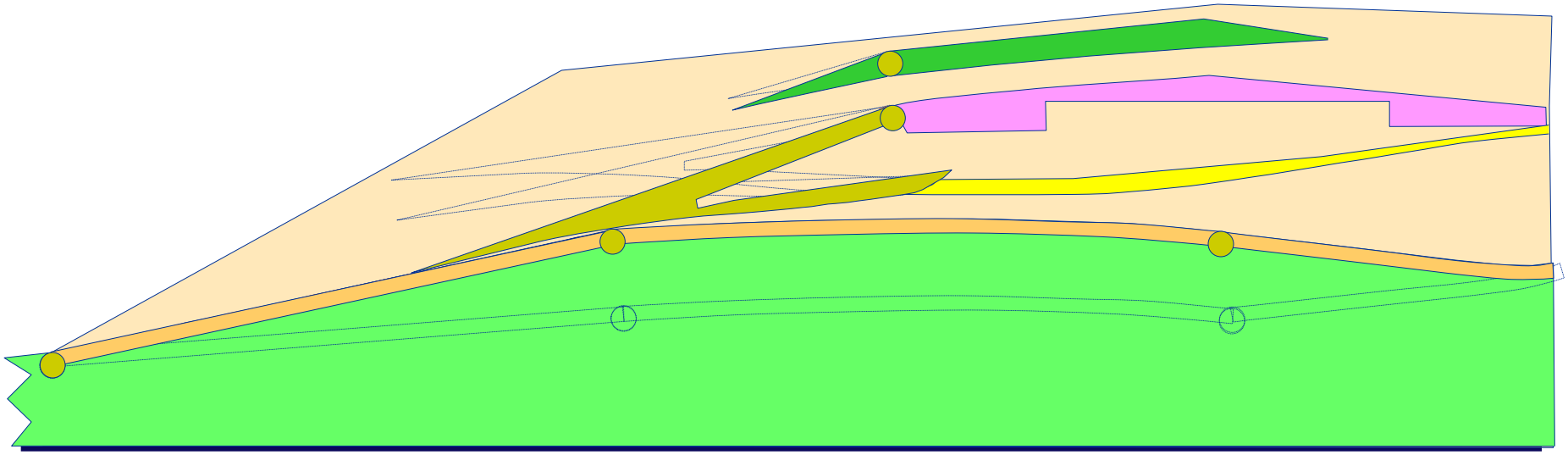


Mode Transition Experiment

Simultaneous control of all actuators:

- HS Cowl
- Splitter
- Ramp
- Bypass Valves 1-4
- HS Cold Pipe Plug
- LS Cold Pipe Plug

M = 4, low-speed inlet closed.



System Identification Experiments

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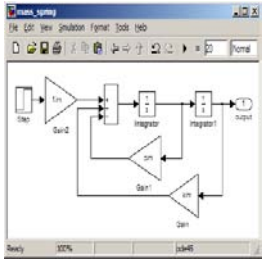
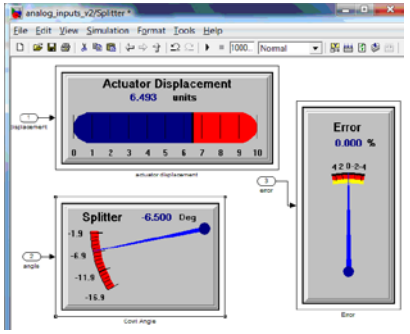


MATLAB Simulink Model

Host PC



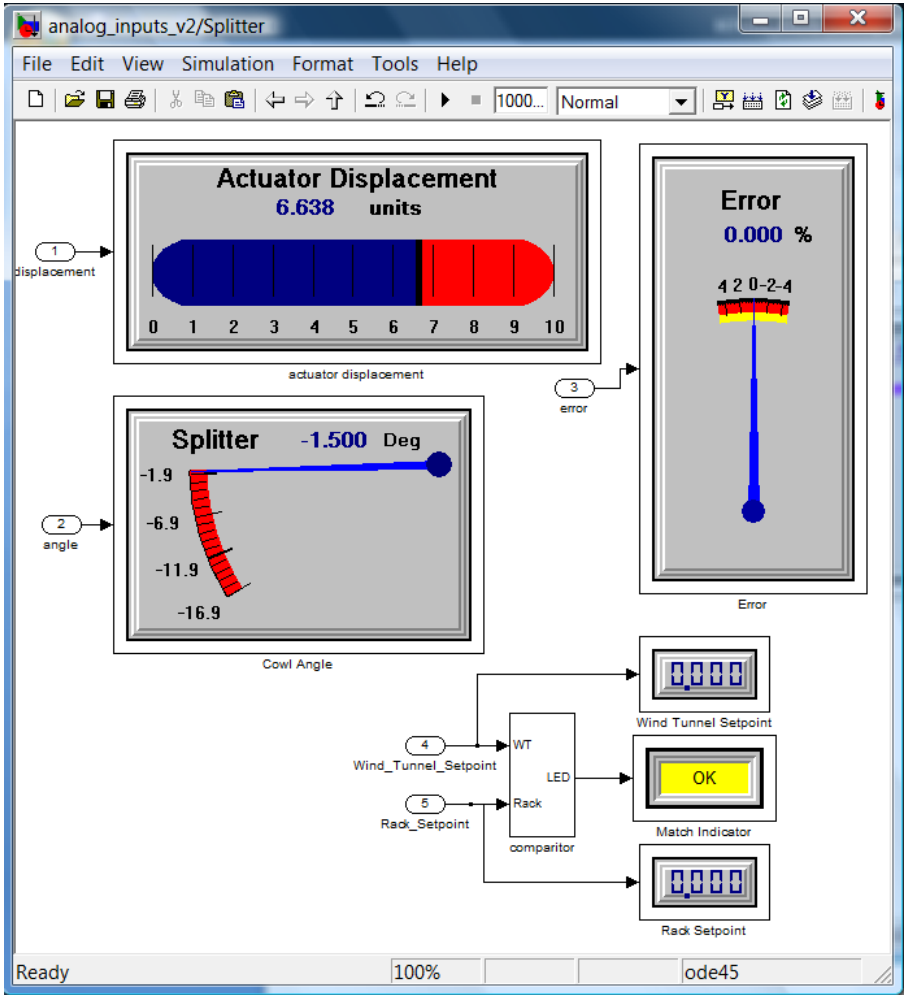
Graphical User Interface

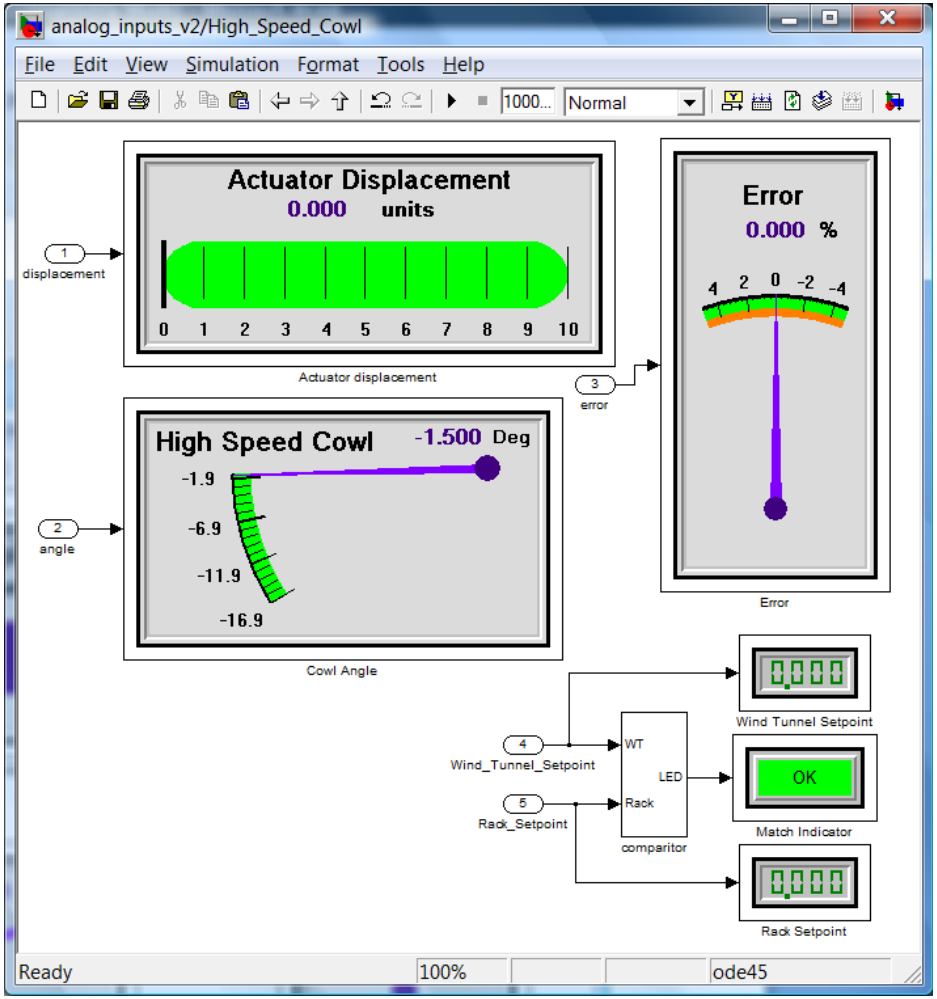
TCP-IP

Instrumentation Rack with Target PC

L-IMX

System Identification Experiments





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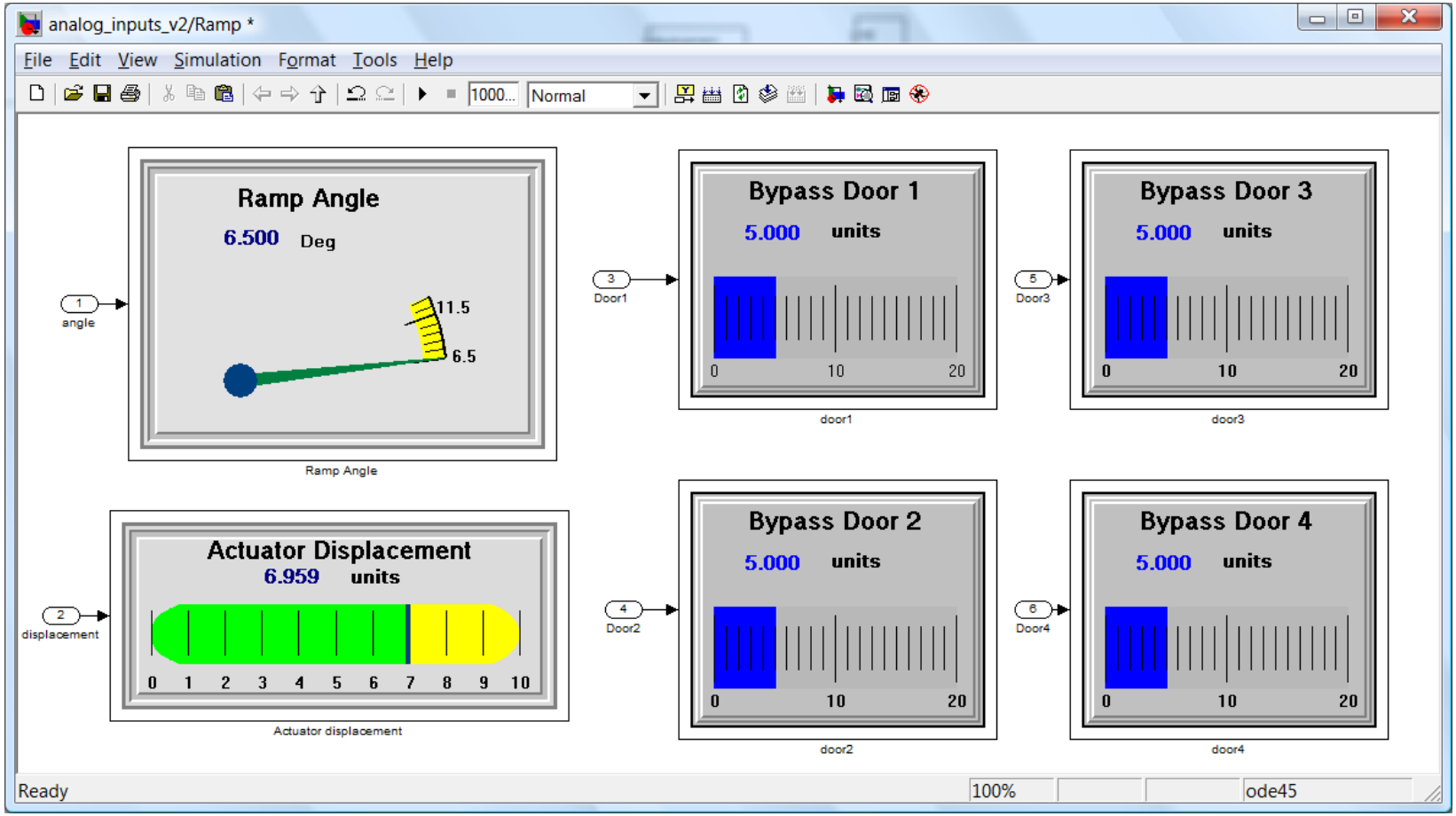
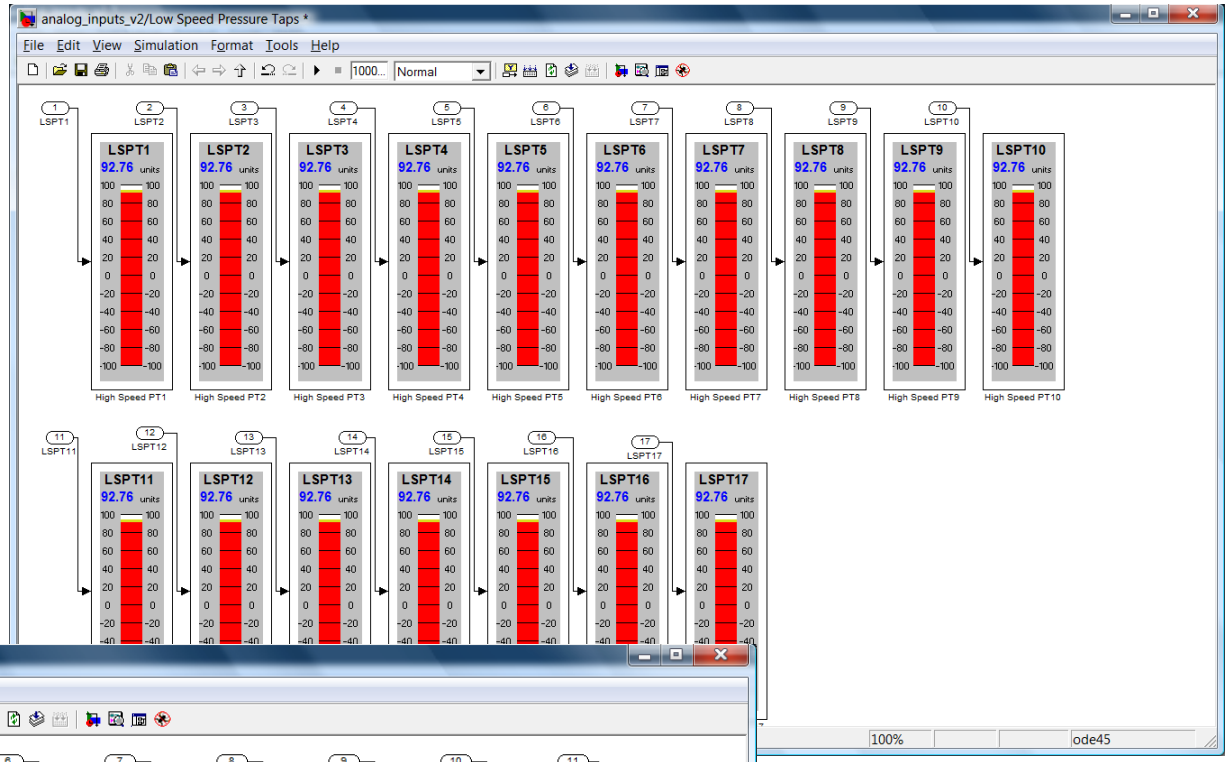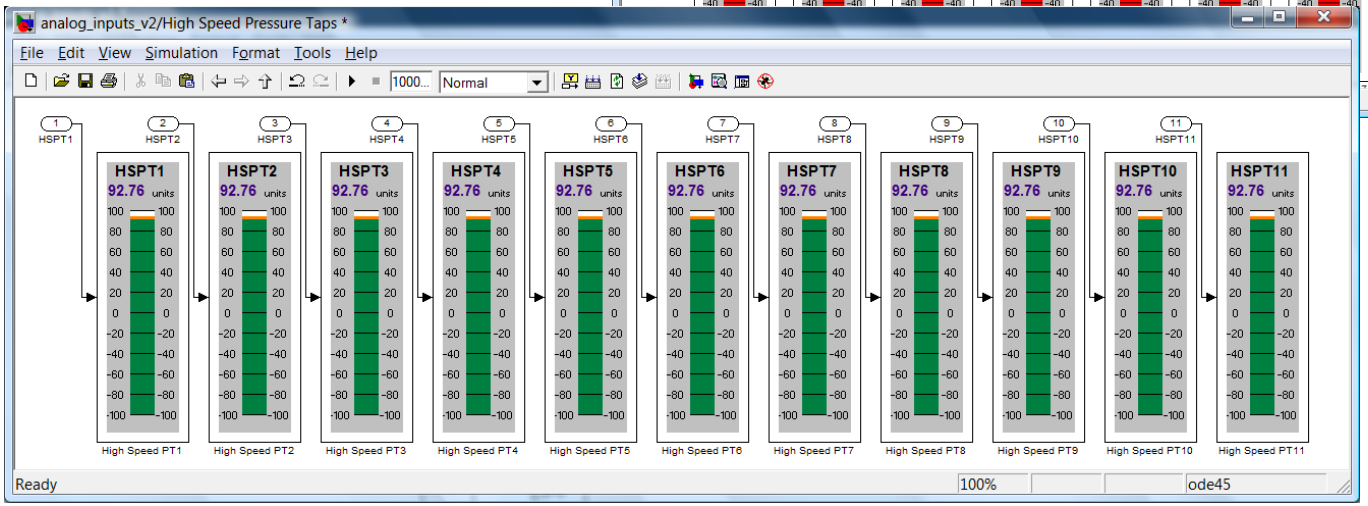
System Identification Experiments