New Motion Pattform
how current developments may improve simulator training effectiveness

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   - civil/military

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   - civil/military

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   - civil/military
Principle of spatial orientation

Vestibular System: 10%
Proprioceptors: 10%
Orientation Sense: 80%
Visual System: 80%
What if visual reference fails?

- **Vestibular System**
  - 50%

- **Proprioceptors**
  - 50%

- **Visual System**

**Orientation Sense**
Motion is getting more and more important !!!
State-of-the-Art simulation design for commercial airliner market

- Type-specific twinseater cockpit
- Realistic aircraft control behavior
- High fidelity visual system
- Realistic sound generation
- Integrated training capabilities
- Limited motion capabilities
  - Limited attitude control
  - No sustained G-Forces

source: internet - LFT
State-of-the-Art simulation design for military applications

- Type-specific cockpit
- Realistic aircraft control behavior
- High fidelity visual system
- Realistic sound generation
- Integrated training capabilities
- No motion capabilities

source: AMST
State-of-the-Art simulation design for driving applications

- Type-specific car-cockpit
- Realistic car control behavior
- High fidelity visual system
- Realistic sound generation
- Integrated training capabilities
  - Limited motion capabilities
    - Limited attitude control
    - No sustained G-Forces

source: internet - Daimler
Simulation design for research applications

- Generic cockpit
- Designed for gaining knowledge in human motion perception
- High fidelity visual system
- Realistic sound generation
- Enlarged motion capabilities

source: MPI
How to improve motion perception in sim‘s?

Adequate motion filtering!!!
Motion filter design

Accelerations linear/angular

SIMULATOR

Real data
Simulation
Optimization

States
Constraints
Performance Criterion

Optimization

Motion Perception

Switch w/o perception

Motion Perception
Most demanding developments in simulator design

Scenarios beyond ‘normal flight’
Most demanding developments in simulator design

What are current simulator needs?

straight and level flight…. and…
Most demanding developments in simulator design

What are current simulator needs?

More advanced procedures
Most demanding developments in simulator design

Improved Motion Platforms!!!
Spatial Disorientation Trainer
One step further

Next Generation Platforms!!!
Next generation motion platforms

Flight Simulator

Disorientation Trainer

Human Centrifuge
DESDEMONA

- Full attitude control
- Sustained 3G in any direction
- Modular design
- Exchangeable cockpits
- High fidelity visual system 120x40deg
- Realistic sound generation
- Highly adaptable and reconfigurable

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## DESDEMONA performance

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<th>$G_z$</th>
<th>$G_x, G_y$</th>
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<td>performance</td>
<td>3 G</td>
<td>3 G</td>
<td>1 G/s</td>
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<table>
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<th></th>
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DESDEMONA architecture

- Flightsim
- Spacesim
- Carsim
- Motioncueing
- Profilegenerator
- SD-training

DESDEMONA core

Integrated System
DESDEMONA NG

- Full attitude control
- Sustained high-G
- Adequate G-onset
- High agility
- Modular design
- Exchangeable cockpits
- High fidelity visual system 240x120deg
- Realistic sound generation
- Highly adaptable and reconfigurable
DESDEMONA for flight training

F-16 inverted deep stall
WELCOME TO AMST

DESIGN and MANUFACTURING of
SPECIALISED TRAINING SOLUTIONS and
PILOT TRAINING DEVICES

we perform training for the fastest people world-wide

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THANK YOU FOR YOUR ATTENTION

Any Questions?