CAIDRE

TRIDENT MARINE

- OPERATIONS
- DESIGN
- TRAINING

STR.EU.COM

DIGITAL HUMAN MODELING TO ENHANCE THE BOAT DESIGN PROCESS

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CADRE

FIX THIS ?....

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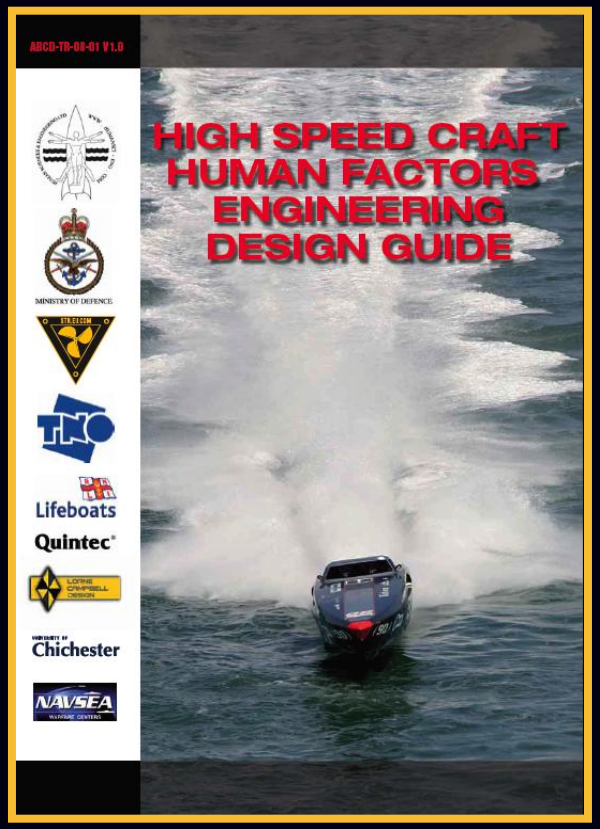
INTRODUCTION - 1

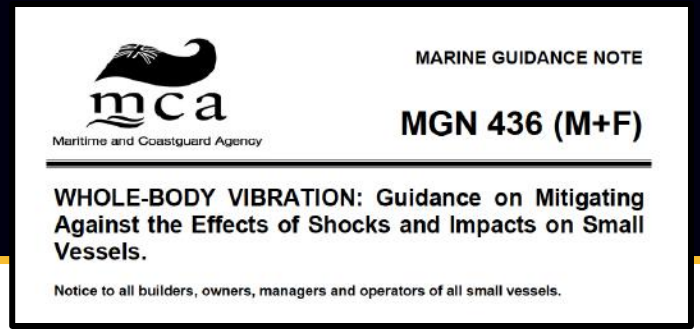
NEED FOR IMPROVED ERGONOMICS

- HSC Human Factors Engineering Design Guide
- www.str.eu.com/human-factors-design-guide.php



INTRODUCTION - 2

- NEED FOR IMPROVED ERGONOMICS
  - MAIB Reports
  - MCA MGNs



mca
Maritime and Coastguard Agency

MARINE GUIDANCE NOTE

MGN 436 (M+F)

WHOLE-BODY VIBRATION: Guidance on Mitigating Against the Effects of Shocks and Impacts on Small Vessels.

Notice to all builders, owners, managers and operators of all small vessels.

3. Posture

3.1 The design of the craft should allow the occupants to maintain their postural stability at all times during a voyage.

3.2 Design features to support the individual's postural stability should be provided. This may include seating, foot straps and handholds.

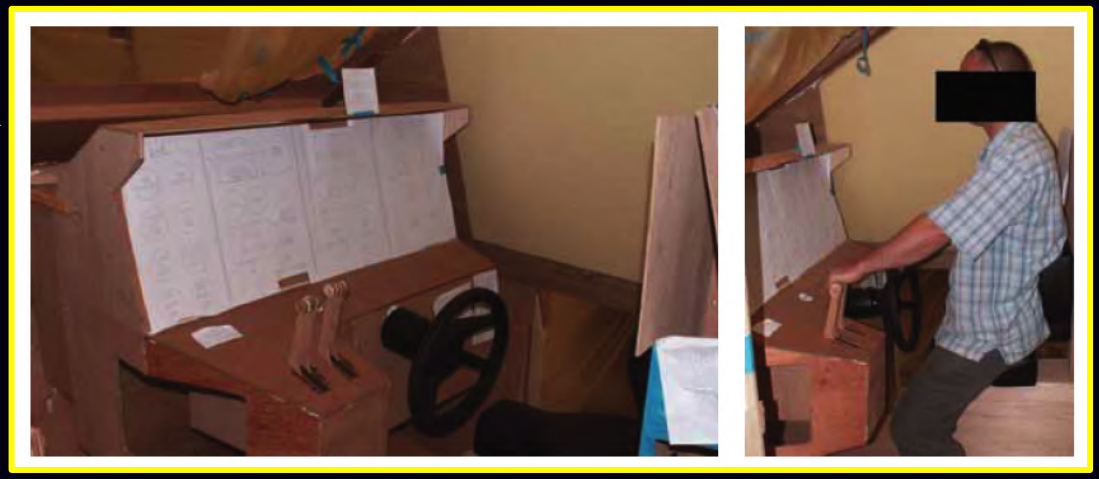
3.3 An upright posture, with the spine in neutral alignment (natural 'S' shape) should be maintained whilst facing in the direction of travel, i.e. sitting or standing sideways generally results in the occupant adopting a twisted spine thus increasing the stress on the spine and increasing the risk of injury.

INTRODUCTION - 3

- PHYSICAL MOCK-UPS

INTRODUCTION - 4

- PHYSICAL MOCK-UPS
  - Class 1
  - Class 2
  - Class 3

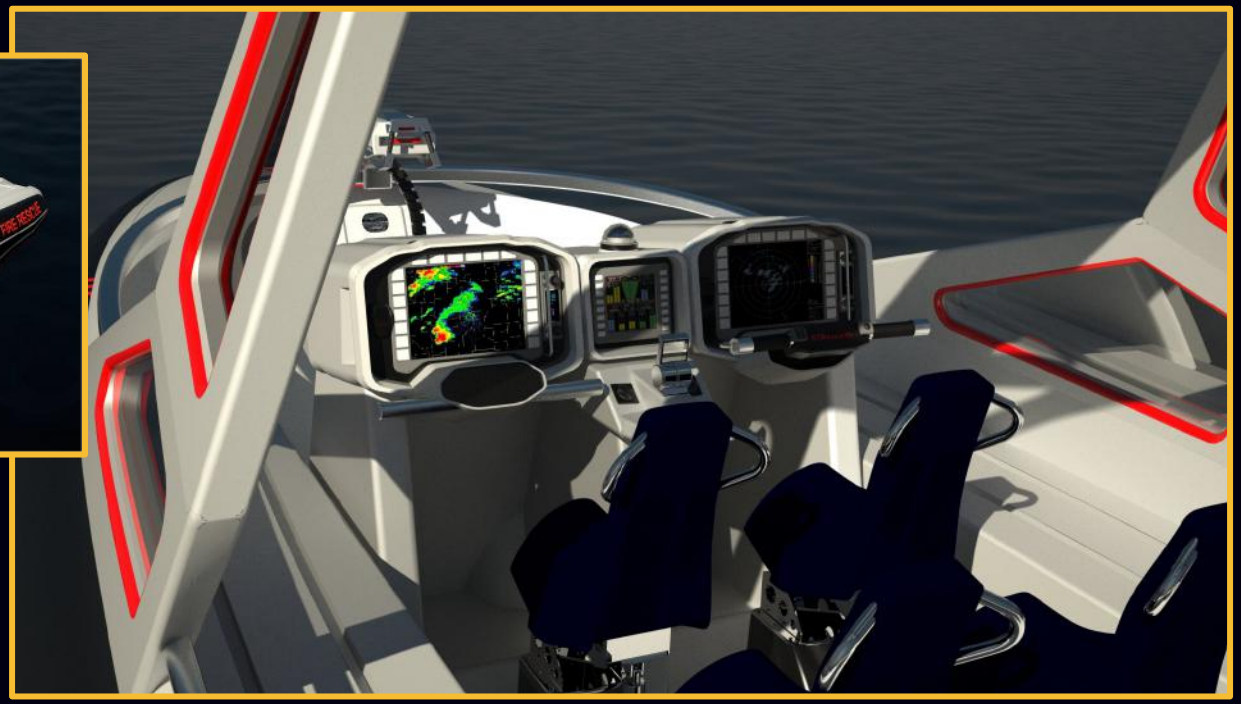


BUT

- Mock-ups are rare and therefore alternative design support is required

3D COMPUTER AIDED DESIGN (CAD)

- CAD Software helps
  - Now photo-realistic capability



3D COMPUTER AIDED DESIGN (CAD)

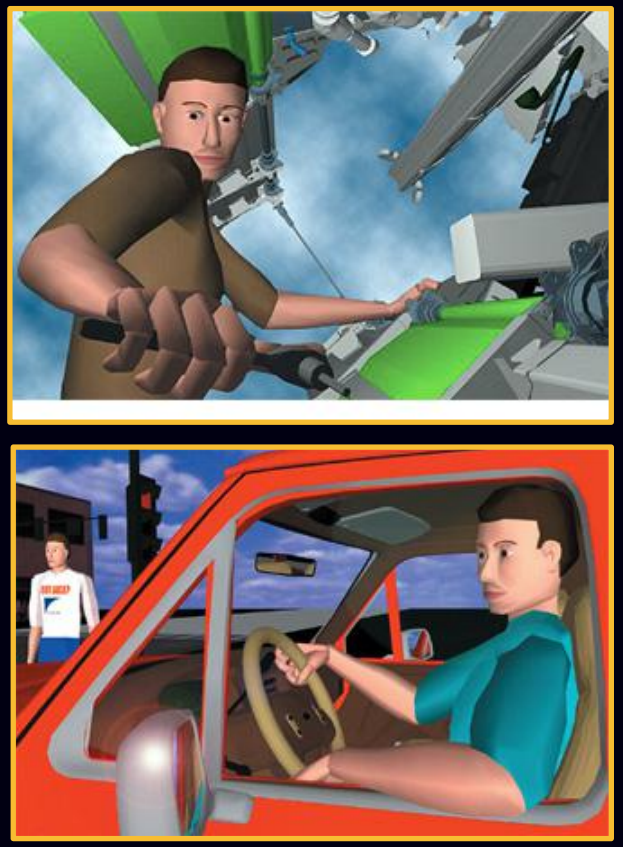
- CAD Software helps
  - Now photo-realistic capability
  - Enhances stakeholder dialogue
  - Potential for enhancing design process effectiveness

BUT

  - The design can look good but not be ergonomically effective
  - Need to be able to visualise the human interacting with the system

DIGITAL HUMAN MODELS

- Current Benchmarks
  - POSER
  - JACK
  - RAMSIS



DIGITAL HUMAN MODELS

- RAMSIS – 1
  - Derived from automotive

DIGITAL HUMAN MODELS

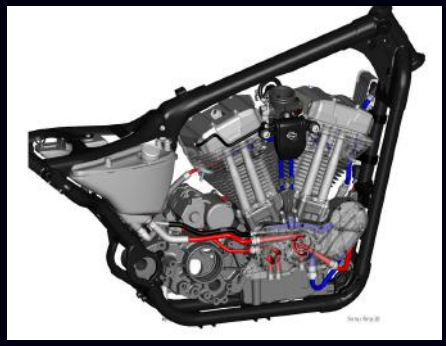
- RAMSIS - 2

STAKEHOLDER ENGAGEMENT

- Clothing & Equipment

DEVELOPING MARINE SPECIFIC DHMs

- SIZE & SPACE ENVOLOPES - 1
  - Real Clothing & Equipment
    - Thermal insulation
    - Waterproofs
    - Lifejacket
    - Operational equipment
  - Insert DHM into CAD environment



  - The human (DHM) becomes a ***REAL*** component

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DEVELOPING MARINE SPECIFIC DHMs

- SIZE & SPACE ENVOLOPES – 2
  - Ingress & egress
  - Move around the craft with enough clearance
    - requirement for individuals to pass
  - Seats
    - get in and out
    - fit within or on the seat
  - Ability to reach the required features from the natural seated position
    - e.g. handholds and controls
  - Escape & Evacuation

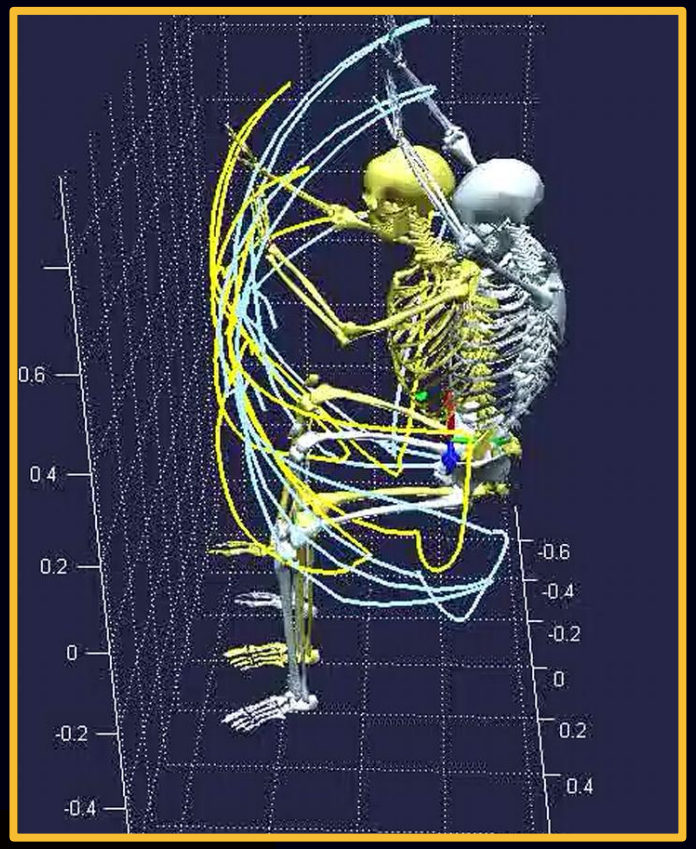
DEVELOPING MARINE SPECIFIC DHMs

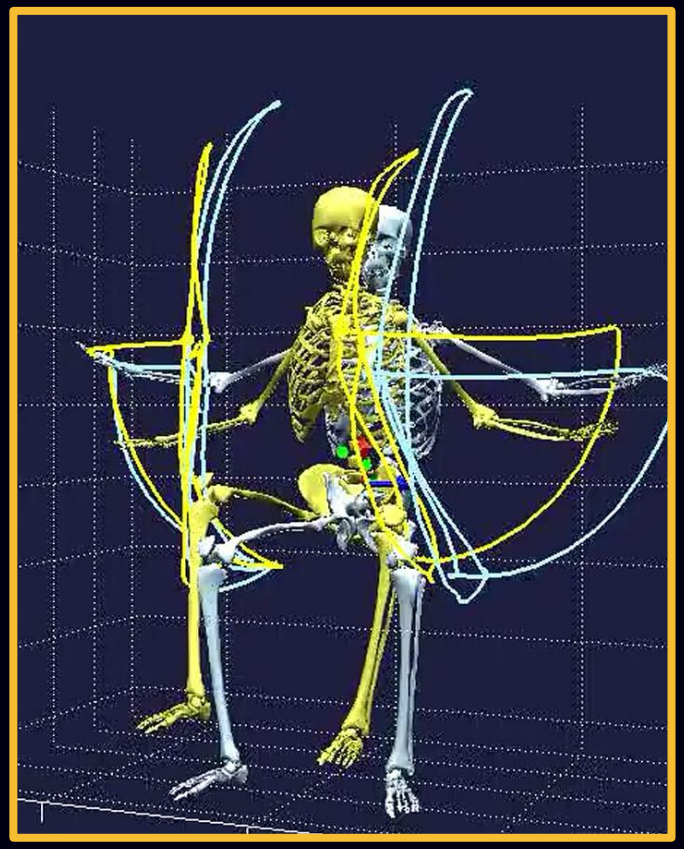
- MOTION CAPTURE
  - Quantify restricted Range-of-Motion

MOTION CAPTURE : Quantify Restricted Range-of-Motion

DEVELOPING MARINE SPECIFIC DHMs

- MOTION CAPTURE
  - Quantify restricted Range-of-Motion





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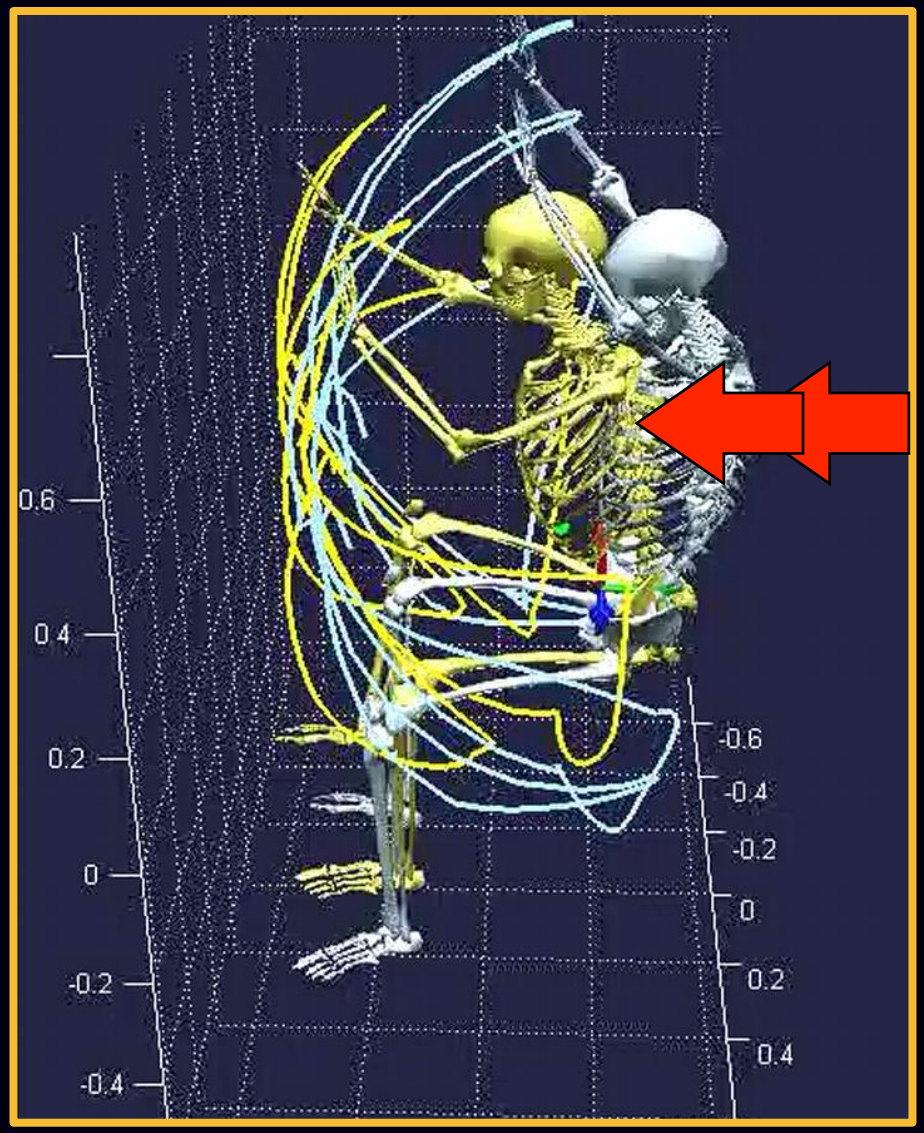

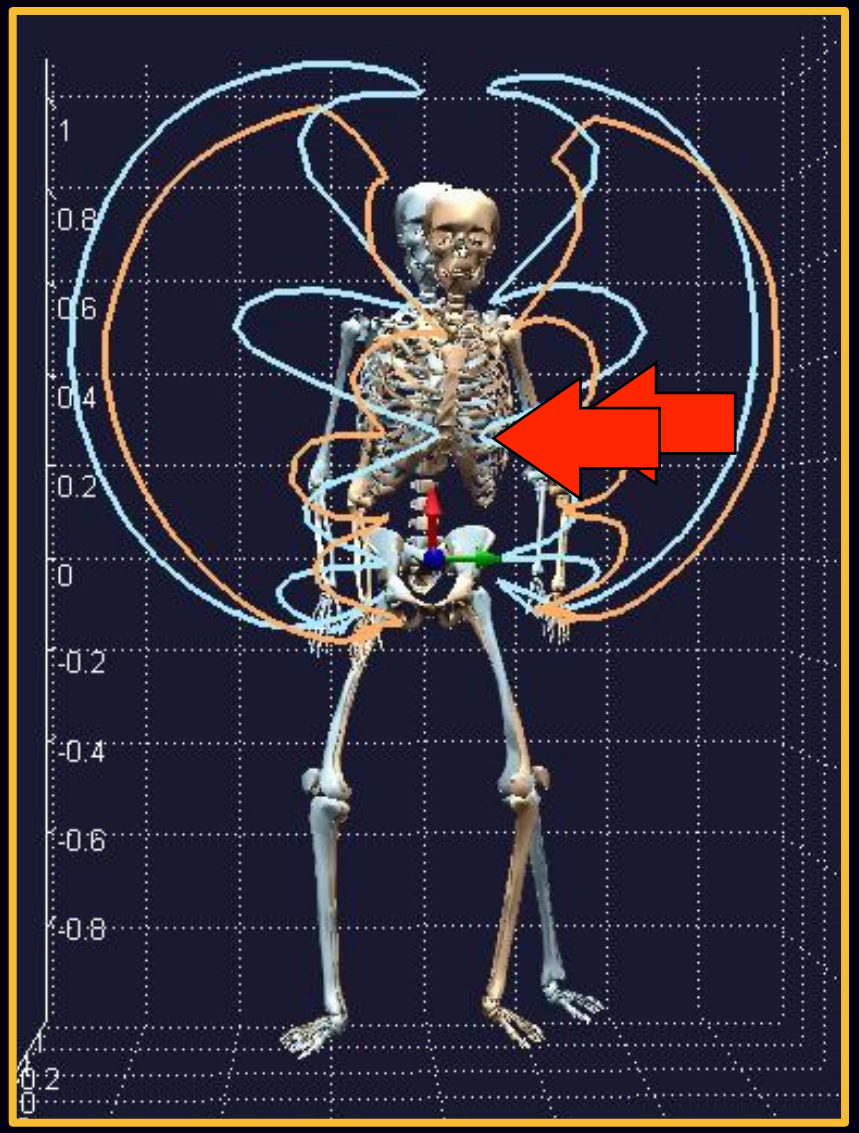

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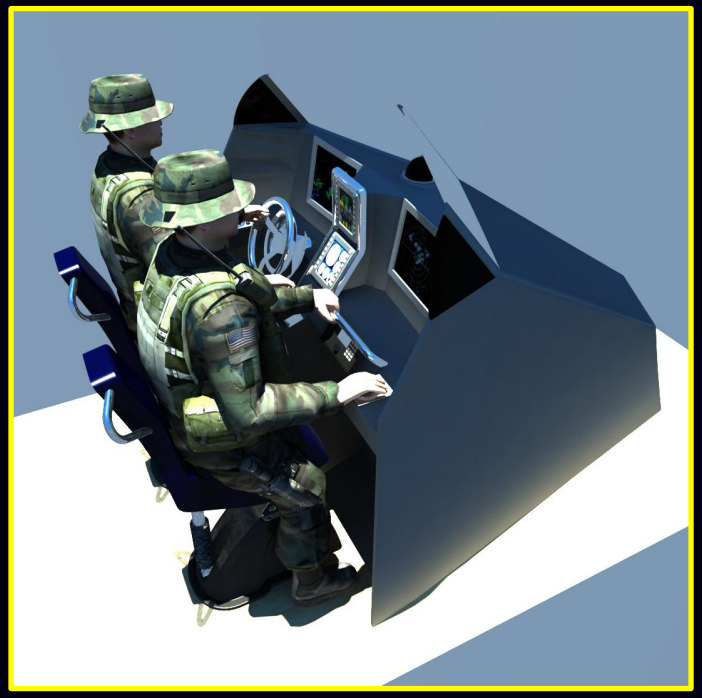
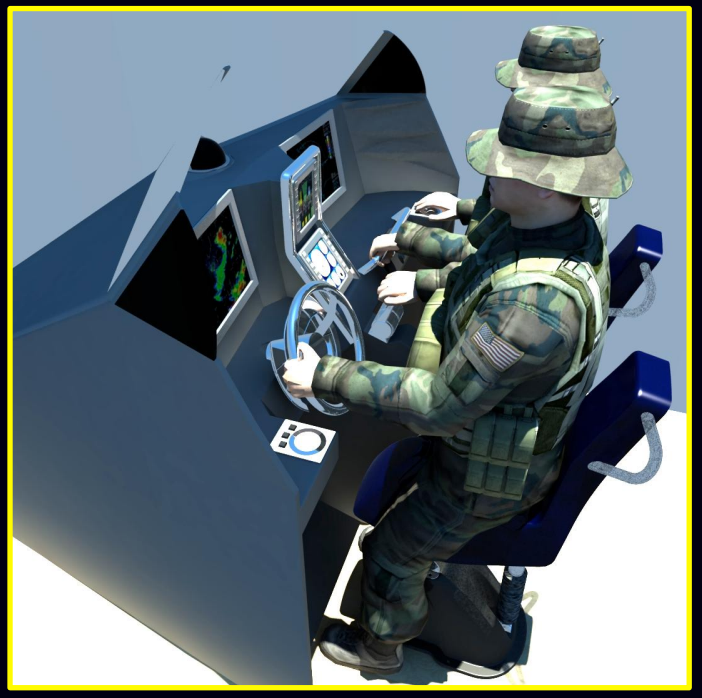
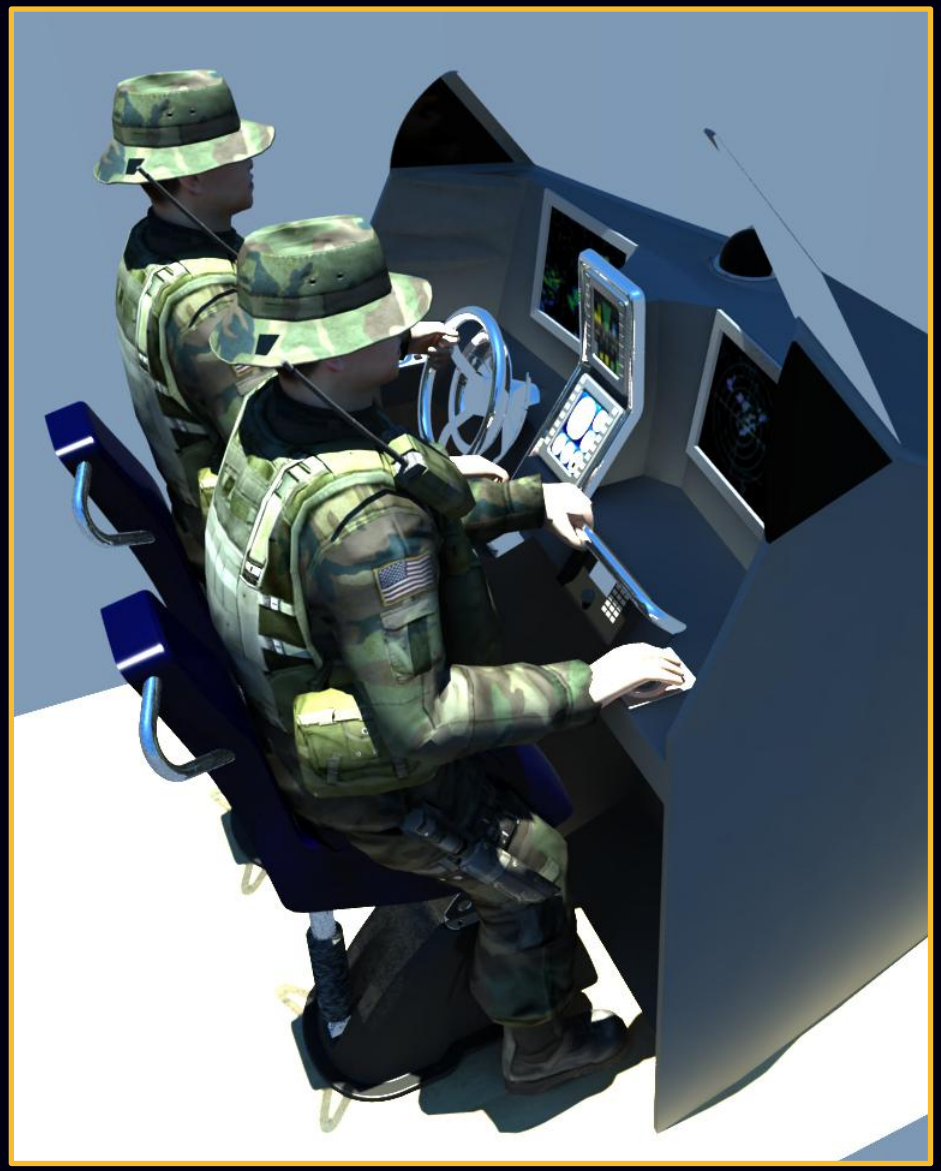
DEVELOPING MARINE SPECIFIC DHMs

- Still Image Analysis







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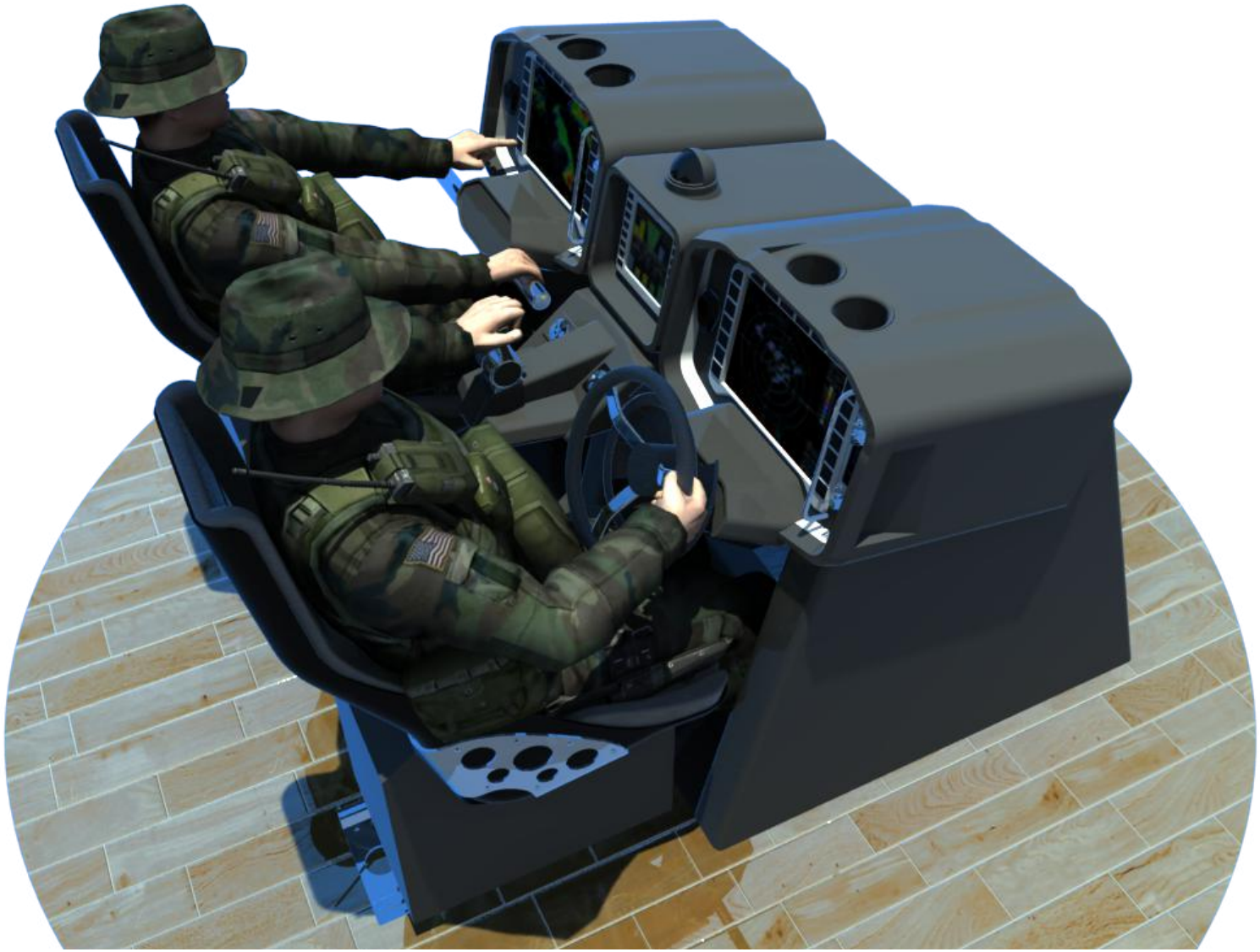

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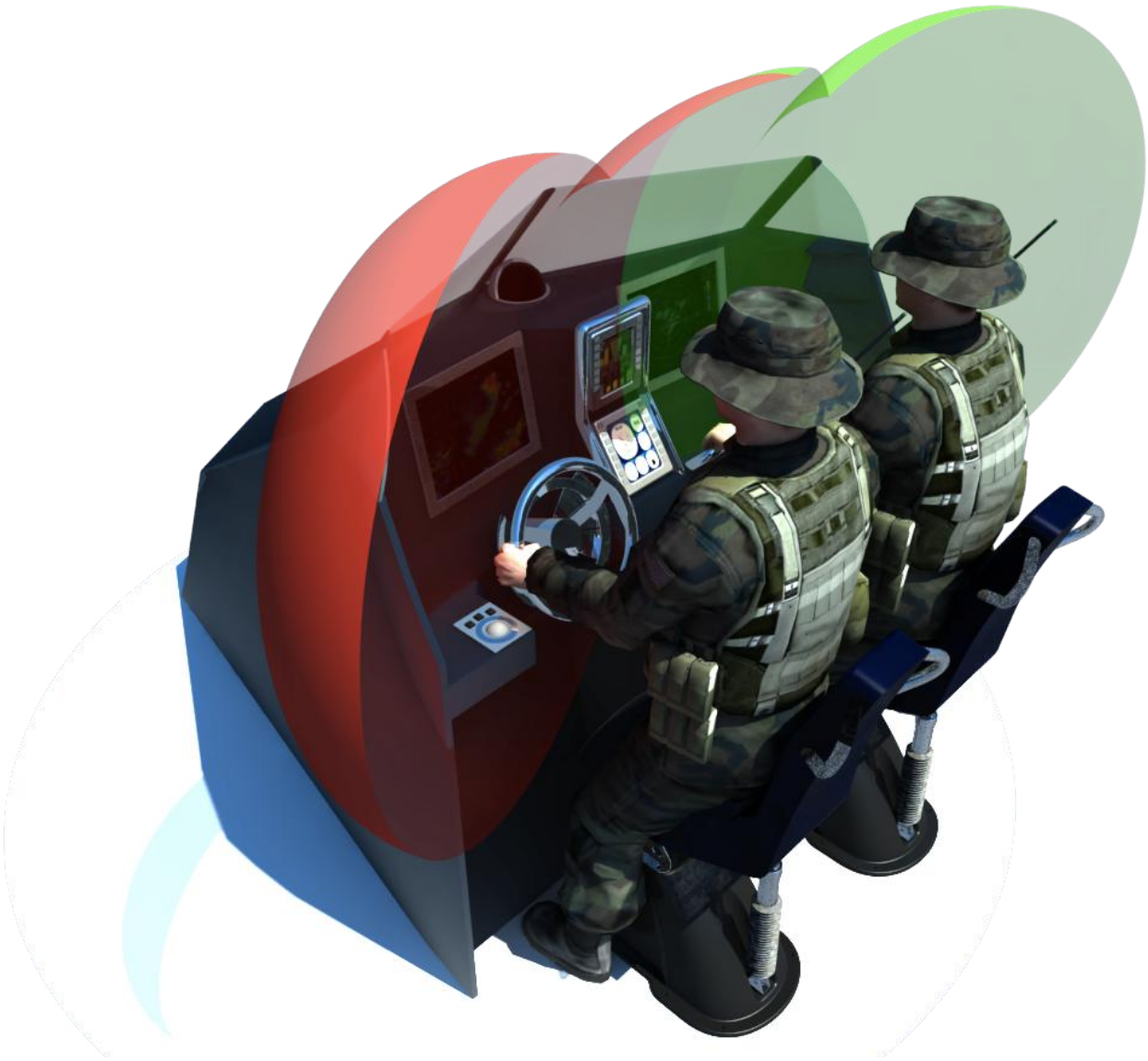

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CONCLUSIONS

- Motion Capture quantified restricted Range-of-Motion caused by marine specific clothing and equipment
- Demonstrated ability to produce DHM wearing operationally relevant clothing and equipment
- Demonstrated ability to integrate marine-specific DHM with CAD
- Therefore enhanced potential for improved HF/ ergonomics while the design is still on the *'drawing-board'*

ACKNOWLEDGEMENTS

- Support:
  - SEEDA
  - MOD; DE&S NAG

QUESTIONS ?

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