Defence Materiel Organisation
Ministry of Defence

Physical Loads FRISC
Steps taken forward

HSBO 2016

DMO

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Overview

- Introduction
- Working group physical loads FRISC
- Short term solution
- Measuring campaign

Fast Raiding Interception Special forces Craft FRISC

Operational context

- FRISC characteristics -> New operational concepts
- a vital link between mothership/base and operational target
- FRISC is a ‘weapon sytem’
- …. a ‘game changer’
- ..has huge operational potentials,
- but…human is the limiting factor !

Working group physiscal loads FRISC

- Multidisciplinary team on issues on physical loads FRISC

- Operational specialists
- Medical specialist
- Technical specialists

- Motions
- Noise
- Equipment

Short term solutions

- Sail and recovery table
  - Developed by the working group
  - Based on experience
    - Vessel type
    - Sea state
  - Used in practice
- Specific sports training

Measuring campaign

- Personnel
  - Logging activities
  - Dosimetry
  - Health monitoring program
- Seats
  - Drop tests
  - Madymo analysis

Logging activities

- No Sortie
- Pre-Sortie
- Post-Sortie
- Every week

Logging activities

- Date and time
- Sailing time
- Equipment

- Pain
- Tiredness
  - Physical
  - Mental
- Sleep
- Other activities
- Alcohol and medication

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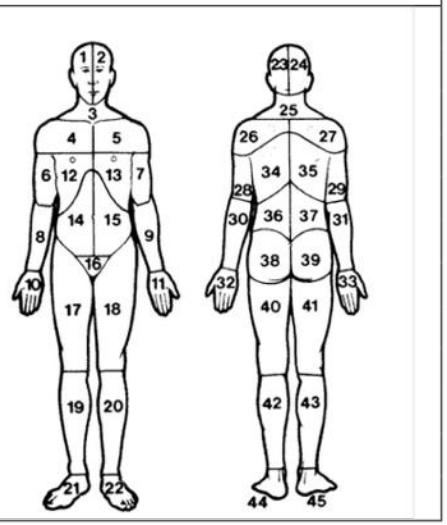
	☐ ☐ ☐ ☐ ☐		
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Dosimetry

- Phase 1 – Pilot
- Phase 2 – Validation
- Phase 3 – Data aquisition
- Phase 4 - Implementation

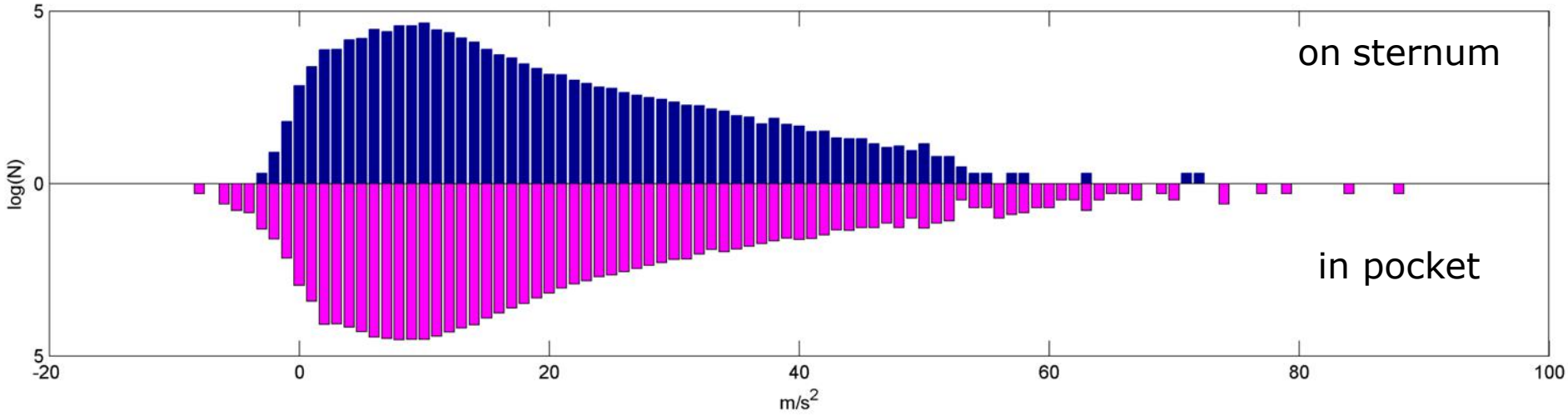
±3 x 5 x 1,5 cm

Note:
dose = amplitude, duration, heading and posture orientation

- 3 accelerometers ±2 g
- 3 accelerometers ±16 g
- 3 rotationsensors (gyro's)
- 3 magnetometers
- intern data-logging
- bluetooth
- application with ECG / EMG
- adjustable

Results

- # samples per observed acceleration interval



Health monitoring program

- Non invasive
- Yearly

- Questionnaire
- Biometry
- Urine analysis
- Audiogram
- Physical examination

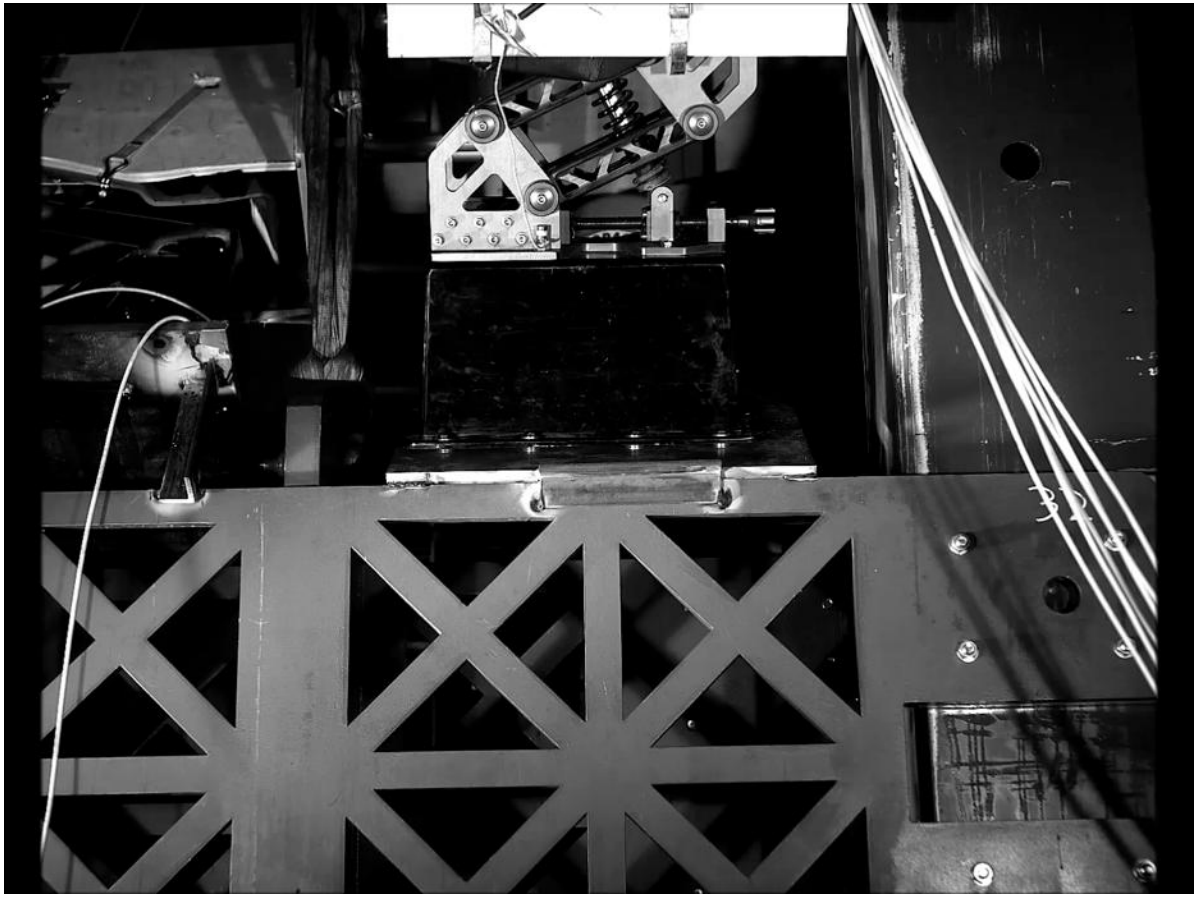
- Additional medical examination/treatment on indication

Seats

- Determine design pulse
  - Impact measurements Curacao & NL
  - Relevant literature
- Drop tests
  - Seat with deadweight
- Calculations with Madymo

Curaçao measuring

Video drop tests

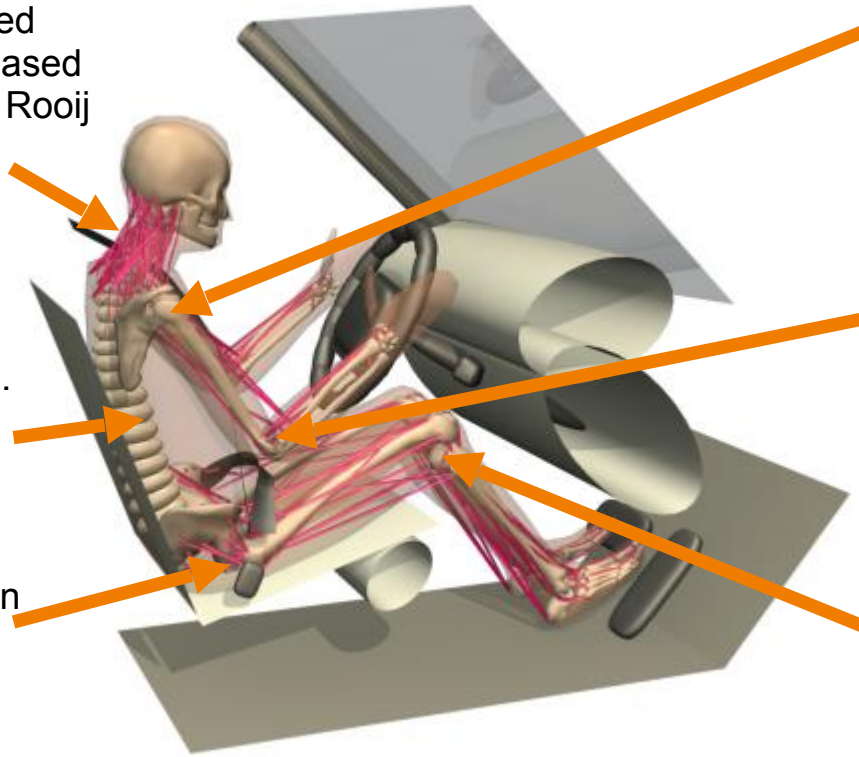


MAthematical DYnamic MOdels (MADYMO)

Multi-body occupant model (based on Happee et al. 1998, 1999, 2000, Meijer et al. 2008)

Controlled ***head*** position using ***neck*** muscles (van der Horst 2002, Meijer et al. 2012, 2013) + balanced muscle recruitment (based on Nemirovsky & van Rooij 2010)

Controlled ***shoulder*** positions using actuators (Meijer et al. 2013)



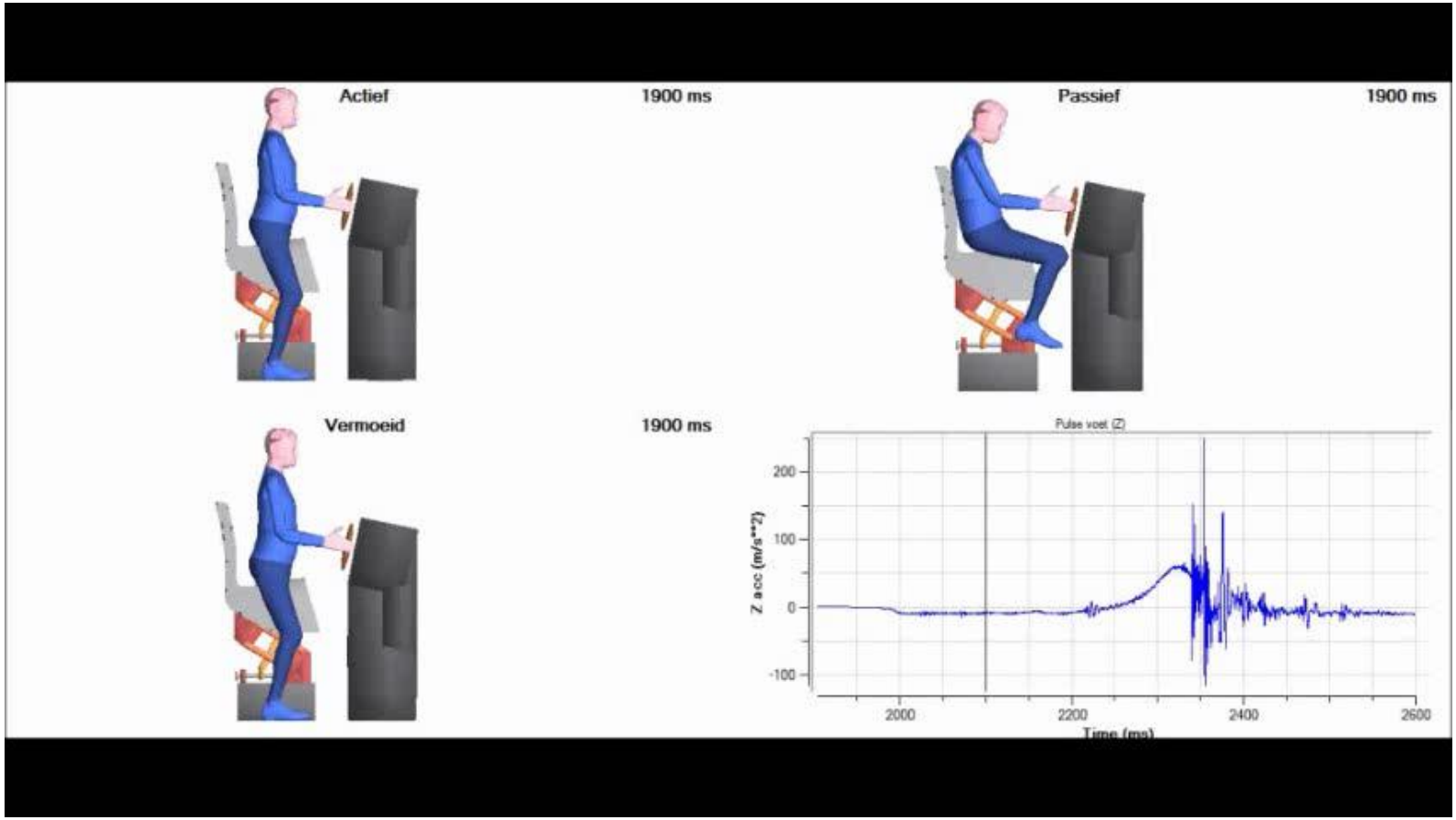
Controlled ***spine*** position using actuators (Meijer et al. 2012, based on Cappon et al. 2007)

Detailed ***arms*** (Meijer et al. 2008) + controlled elbow position using arm muscles (Meijer et al. 2013)

Controlled ***hip*** position using leg muscles (Meijer et al. 2012)

Detailed ***legs*** (Cappon et al. 1999) + controlled knee position using leg muscles (in development)

Video Madymo



Simulator - FSSS

- Motion based simulator

- Protection of trainers
- Train independent of the weather
- Less wear and tear FRISC’s
- Lower fuel consumption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Conclusions

- Short term solutions
- Health monitoring program
- Measuring campaign
- Modelling and simulation
- Long term effects


Thank you for your attention
Questions?