

TRB EMS Subcommittee ANB10(5)

EMS Safety Summit 2012

Safety Systems, Strategies and Solutions

Integrating Ergonomics, Automotive Safety and Cost Efficiency “designing medical interiors for optimal safety”

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Overview

- Integration of ergonomics, automotive safety and cost efficiency via a systems approach
- Examples
 - layout
 - Equipment
- New direction in evaluating human requirements and performance

“Systems” approach

- Incorporation of ergonomics in ambulance design reflects a systems approach
- Accommodation of people, equipment and resources occurs in the context of a range of interactions and a need to establish and maintain minimum safety
- Ergonomics and automotive safety requirements can be use to define the system
(see earlier presentations)
- Efficient, safe and functional design should deliver cost efficiencies (vehicle operation, human resources and equipment)



Some System Interactions

- Stretcher loading and unloading
- Patient handling equipment selection and use
- Seating with in the rear compartment
 - Side / forward facing
 - Front / rear facing

Stretchers

Manual versus mechanical





stryker

stryker

stryker

stryker



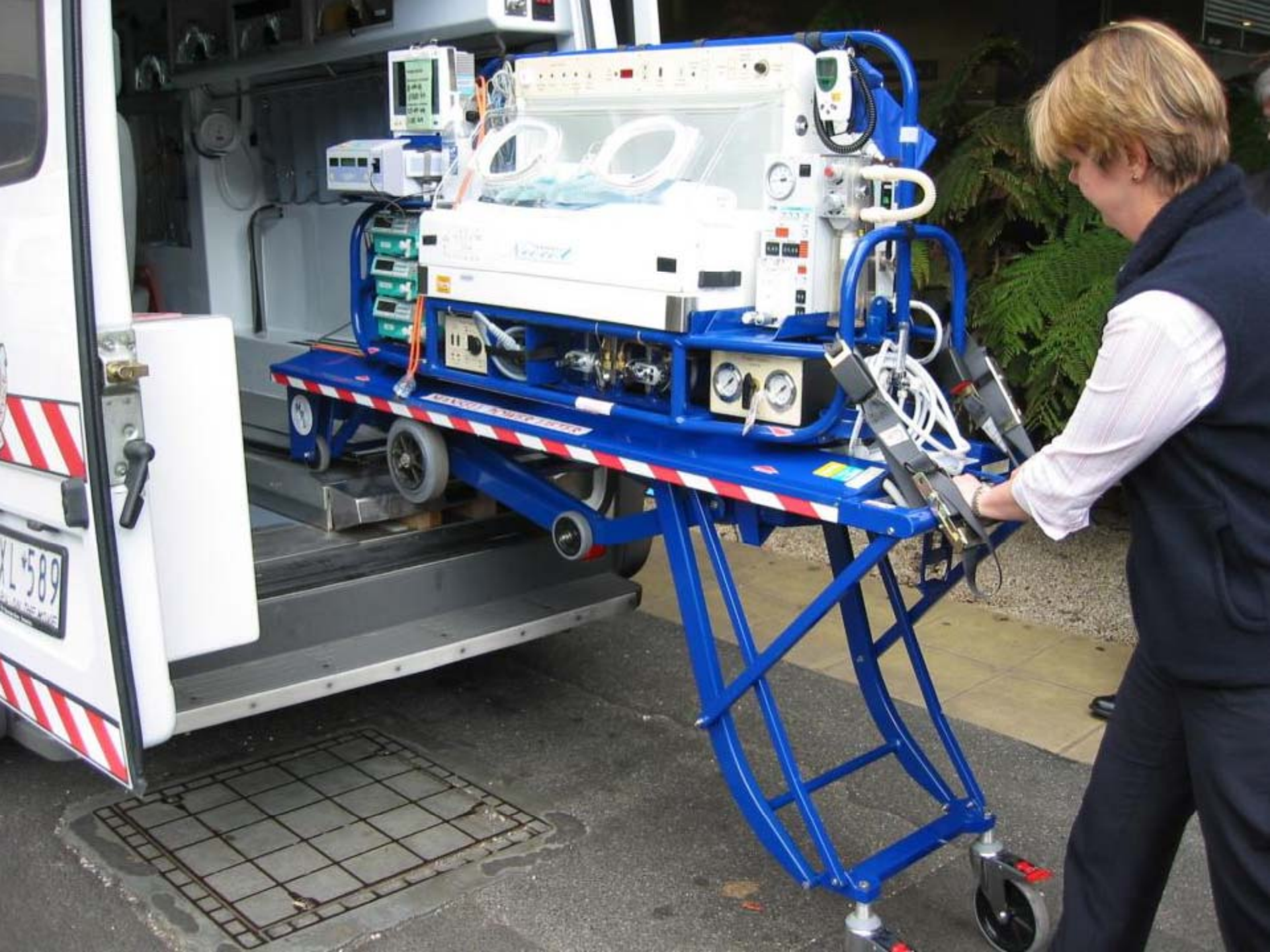
















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Image from Ronald Rolfson

Stretcher selection

- To satisfy response requirements
- Design benefits versus cost and impact
- Either way, accommodation and design consideration is needed for:
 - Loading
 - Restraint
 - Access within the ambulance for treatment
 - Unloading

Patient handling equipment selection and use



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Patient handling equipment selection and use

- New equipment exists to reduce physical work demands and injury risks in the field.
- Does your services need this?
- If so, where will it fit within the ambulance?
- Will it be part of a specialist or general response?
- Design around minimal equipment specifications.
- Provide scope to accommodate new equipment.

Seating – beside patient





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Side facing 4-point harnesses demonstrated to be lethal, even at slow ground vehicle speeds

Richardson S.A., Grzebieta R. H. and R. Zou, Development of a Side Facing Seat and Seat Belt System for the Australian Army Perentie 4 x 4, Int. J. of Crash., 4:3, 239 – 259, 1999



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Seating – beside patient

- Forward facing seats only
- Mobility of the seat forward / rearward and sideways (if needed) and stretcher an advantage
- Paramedic restrained
- Paramedic can access equipment and patient during transit while restrained
- Head impact zones avoided or minimised



Seating – at head end of patient





11/23/2009





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Putting it all together - Norway



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Future directions

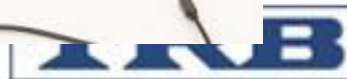
Human modeling

- Using digital modeling to explore new layouts and designs

Live evaluation of human postures and movements

- ViSafe (dorsaVi)
- Continuous measurement of multiple variables for human task performance
 - Posture & movement (back / shoulders / upper & lower limbs)
 - Muscle activity
 - Vibration
 - Acceleration & velocity
- A step closer to dose sampling for physical work demands

Applying the ViSafe Sensors



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Summary

Systems

- Effective application of ergonomics can help to define the system in a meaningful and useful way

Strategies

- Consider operational tasks away from the ambulance to ensure equipment is accommodated
- Consider operational tasks and equipment use within the ambulance for design success
- Design within the context of inherent automotive safety and occupant protection needs

Solutions

- Creative designs that orient the users and occupants safely, provide mobility within the ambulance and enable people and objects to be restrained.



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