

**GRAHAM GREENE**  
**JAA**  
**OCCUPANT SURVIVABILITY PROJECT**  
**ADVISORY GROUP**

**(ON BEHALF OF ICE ERGONOMICS LTD UK)**

# ANTHROPOMETRIC RESEARCH STUDY

- ICE Ergonomics
- J Mark Porter Professor of Design Ergonomics, Loughborough University
- A Moody Professor of Academic Radiology, University of Nottingham

# STUDY OBJECTIVES

- Gather appropriate anthropometric data
- Review values in existing regulations
- Review scope of existing regulations
- Consider physiological aspects of long term sitting

# Contract Award

- ❖ Tenders invited in European Journal
- ❖ JAA review
- ❖ ICE Ergonomics awarded contract

# TIMETABLE

- One year study
- Research Report published September 2001
- Available on [ice.co.uk](http://ice.co.uk)

# CURRENT REGULATIONS (AN64, UK ONLY)

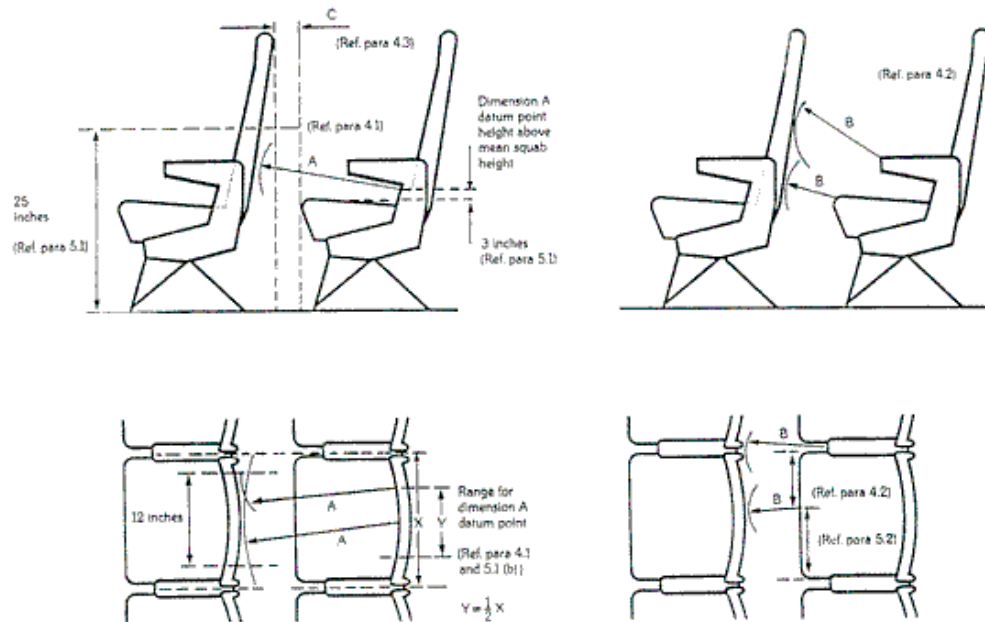


FIGURE 1 MINIMUM DIMENSION REQUIRED BY PARAGRAPHS 4.1, 4.2 AND 4.3

# CURRENT REGULATIONS

## (AN64, UK only)

- **Dimension A:** The minimum distance between the back support cushion of a seat and the back of the seat or other fixed structure in front - 26 inches (660mm)
- **Dimension B:** The minimum distance between a seat and the seat or other fixed structure in front - 7 inches (178mm)
- **Dimension C:** The minimum vertically projected distance between seat rows or between a seat and any fixed structure forward of the seat - 3 inches (76mm)

# STUDY METHODOLOGY

- Reviewed current practice in other forms of transport
- Passenger Survey
- Ergonomist Assessment
- Application of European and Worldwide Anthropometric Data



# PASSENGER SURVEY

- >300 Passenger Questionnaires Analysed
- Greatest number of reported seat access problems associated with dimensions A, B and C
- Mobility problems experienced by 75% of respondents

# ANTHROPOMETRIC DATA

- Mean male UK height increased by 1.7cm between 1981 and 1995!
  - Weight has increased more rapidly!
- 'Peoplesize 2000' used as main data source - (believed to be the most comprehensive collection of static anthropometric information in the public domain)

# (95<sup>th</sup> AND 99<sup>th</sup> % MALE BUTTOCK-KNEE LENGTH

	95 <sup>th</sup> %	99 <sup>th</sup> %
British	677mm (26.7in)	704mm (27.7in)
European	690mm (27.2in)	715mm (28.1)
World	692mm (27.2in)	722mm (28.4)

# PERCENTILE AN64 APPLICABILITY

	Equivalent Percentile
British	88
European	77
World	80

# BRACE POSITION



FORWARD FACING PASSENGER  
BRACE POSITION

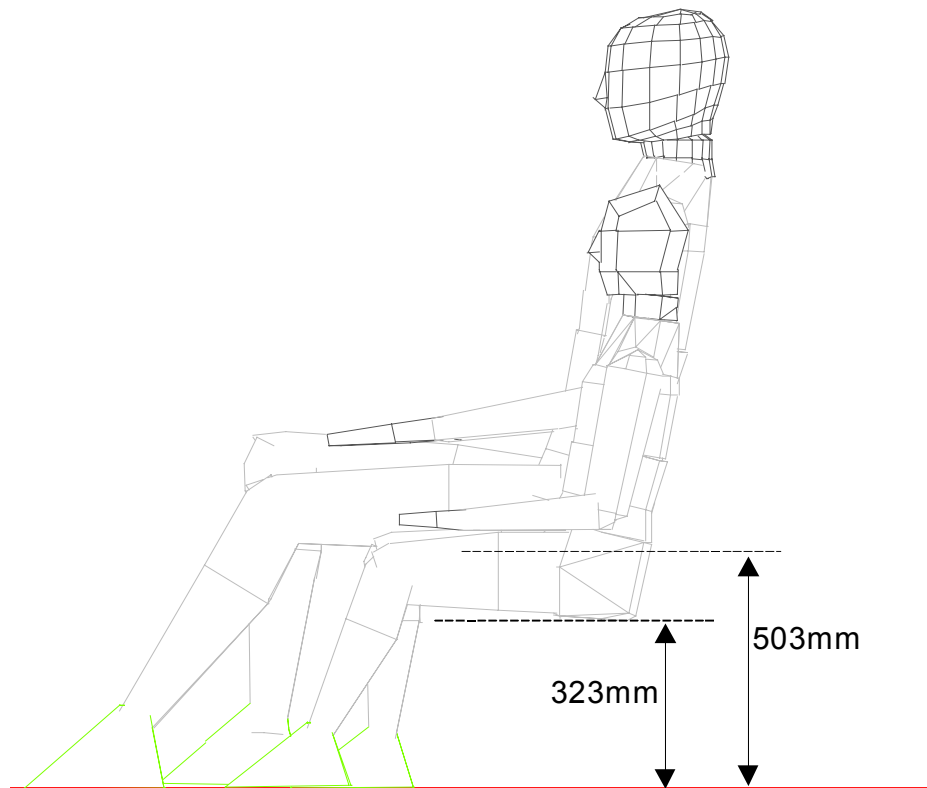
# AN64 DIMENSIONS B AND C

- **Dimension B:** The minimum distance between a seat and the seat or other fixed structure in front - 7 inches (178mm)
- **Dimension C:** The minimum vertically projected distance between seat rows or between a seat and any fixed structure forward of the seat - 3 inches (76mm)

# SEAT CUSHION HEIGHT

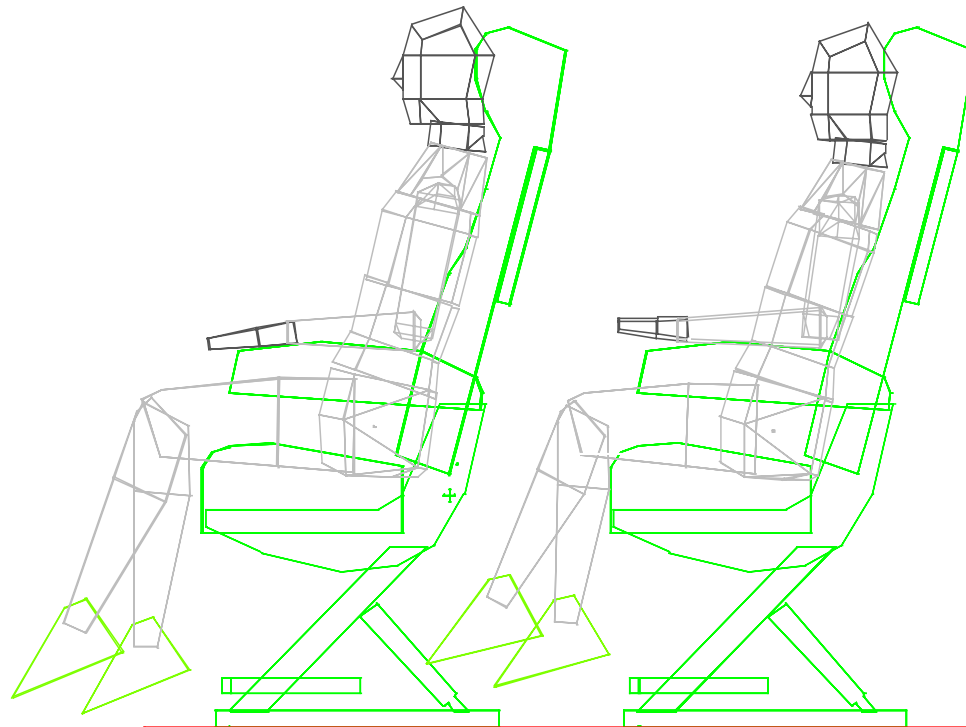
	1 <sup>st</sup> %ile	5 <sup>th</sup> %ile	95 <sup>th</sup> %ile	99 <sup>th</sup> %ile
British	351mm (13.8in)	356mm (14.0in)	499mm (19.6in)	518mm (20.4in)
Europe	351mm (13.8)	356mm (14in)	518mm (20.4)	536mm (21.1)
World	318mm (12.5)	331mm (13.0in)	501mm (19.7in)	520mm (20.5in)

# 1<sup>st</sup> %ile WORLD FEMALE AND 98<sup>th</sup> % WORLD MALE





# 5th %ile WORLD FEMALE (LEFT) AND A 1st %ile WORLD FEMALE (RIGHT) SITTING IN TYPICAL CURRENT HEIGHT SEAT



# HEALTH ISSUES (DEEP VEIN THROMBOSIS)

- Identified during WWII
- Recent concerns
- Study guidelines

# DVT DATA COLLECTION PROBLEMS

- By definition passengers are travelling and therefore collation of data is difficult.
- The disease is often difficult to diagnose clinically.
- Diagnostic tests may miss small clots.
- Presentation may be sometime after the travel episode.
- Asymptomatic disease will go unnoticed.

# PHYSIOLOGY

- 1. Raised venous hydrostatic pressure
- 2. Hypoxia
- 3. Dehydration
- 4. Decreased venous blood flow
- 5. Vein trauma
- 6. Hypercoaguability
- 7. Smoking
- 8. Pre-existing cardiovascular problems
- 9. History of thromboembolic disease

# INCIDENCE

- 1 in 1000 symptomatic
- 100 in 1000 asymptomatic
- Air travel related DVT approximately 10% of total

# PROTECTIVE MEASURES

- Avoiding dehydration
- Exercise
- Aspirin ?

# POTENTIAL FOR AIRCRAFT SEAT DESIGN

The intrinsic factors related to position while seated are:

- Stasis/Low Flow
- Hydrostatic Pressure

# NEED FOR FURTHER RESEARCH

- DVT - World Health Organisation Study
- Evacuation Studies to investigate mobility issues



# REGULATORY POSITION

## JAA Specialist Group:

- Consider regulatory action
- Specify needs for additional research