



# A Comparison Of Custom Molded Versus Foam In Ear Communication Devices

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# Problem

- Changes In EU Legislation
- Subsequent Change In UK Law
- Modern Jet Fighters Can Exceed 130 Db
- 100 dB In The Cockpit
- Current Protection Equipment Does Not Meet Need
- What Type Of Ear Plug Is Perceived As More Comfortable And Functional



# Task

- RAF CAM Tasked By S&AD IPT (Jun 06)
  - Comparative & Quantitative Assessment Of COTS IECDs
  - Precursor To Aircraft Integration/Formal Procurement
  - Provide Aeromedical Advice
  - Provide Ranked List
- Products selected by S&AD IPT



# Scope Of Trial

- Ground Trial
  - Comfort
  - Donning and Doffing
  - Cleaning
  - Altitude Chamber
- Flight Trial
  - In-flight Comfort
  - Communication Quality



# Bias

- Custom Molded Tried First
- Subjects Could Talk To Each Other
- Subjects Past Experience With Ear Plugs



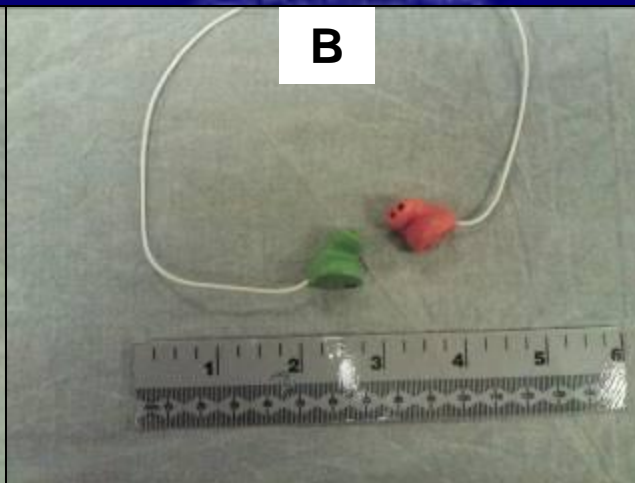
# Assumptions

- Products Built To Specs
- Participants Were Truthful In Reporting



# Ground Trial

– 5 Systems



# Ground Trial

- 6 Subjects
  - 2 Pilots
  - 2 Medical Officers
  - 1 Aerospace Physiologist
  - 2 Survival Equipment Specialists
- Methodology
  - Subjects Wore System In Office Environment
  - 1 Hour Minimum Per Session
  - Used System For Minimum Of 2 Weeks
  - Subjects Logged Each Session
  - Questionnaire Following Use





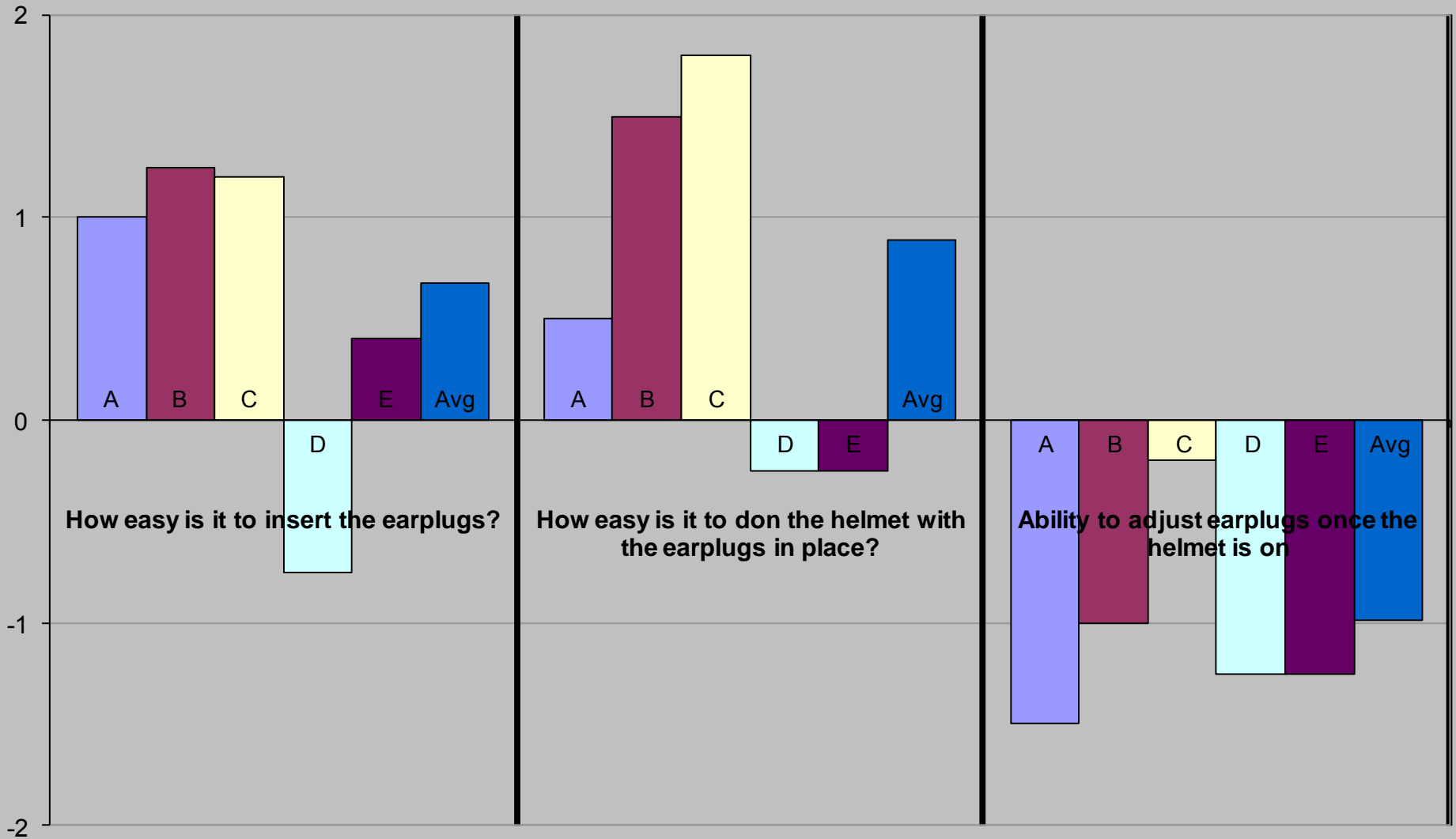
# Results

- Subjects Rated IECD As
  - Fully Acceptable (2)
  - Acceptable (1)
  - Barely Acceptable (-1)
  - Unacceptable (-2)
- Average Obtained And Plotted In Chart



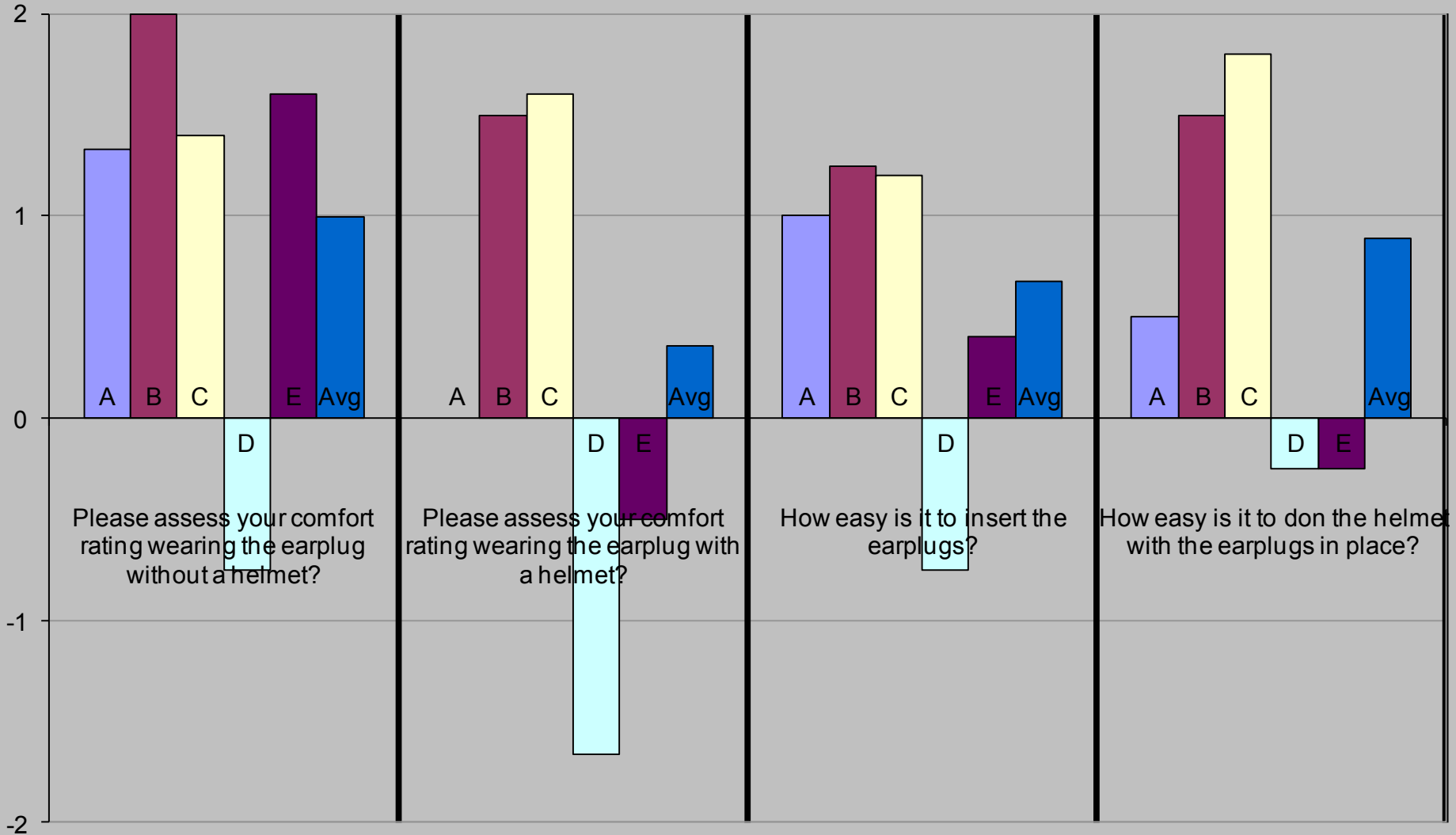
# Results

Helmet Interactions



# Results

## Comfort



# Results

- Custom Moulded Found To Be More Comfortable
- All Systems Vented Without Problems
- IECD “D” Rejected
  - Too Bulky
  - Silicone Splitting
- IECD “E” Rejected
  - Air Tubes Conducted Too Much Noise



# Flight Trial



- Remaining Systems Carried Over To Flight Trial In RAF CAM Hawk
- Subjects
  - 3 Pilots
  - 1 Medical Officer
  - 1 Aerospace Physiologist



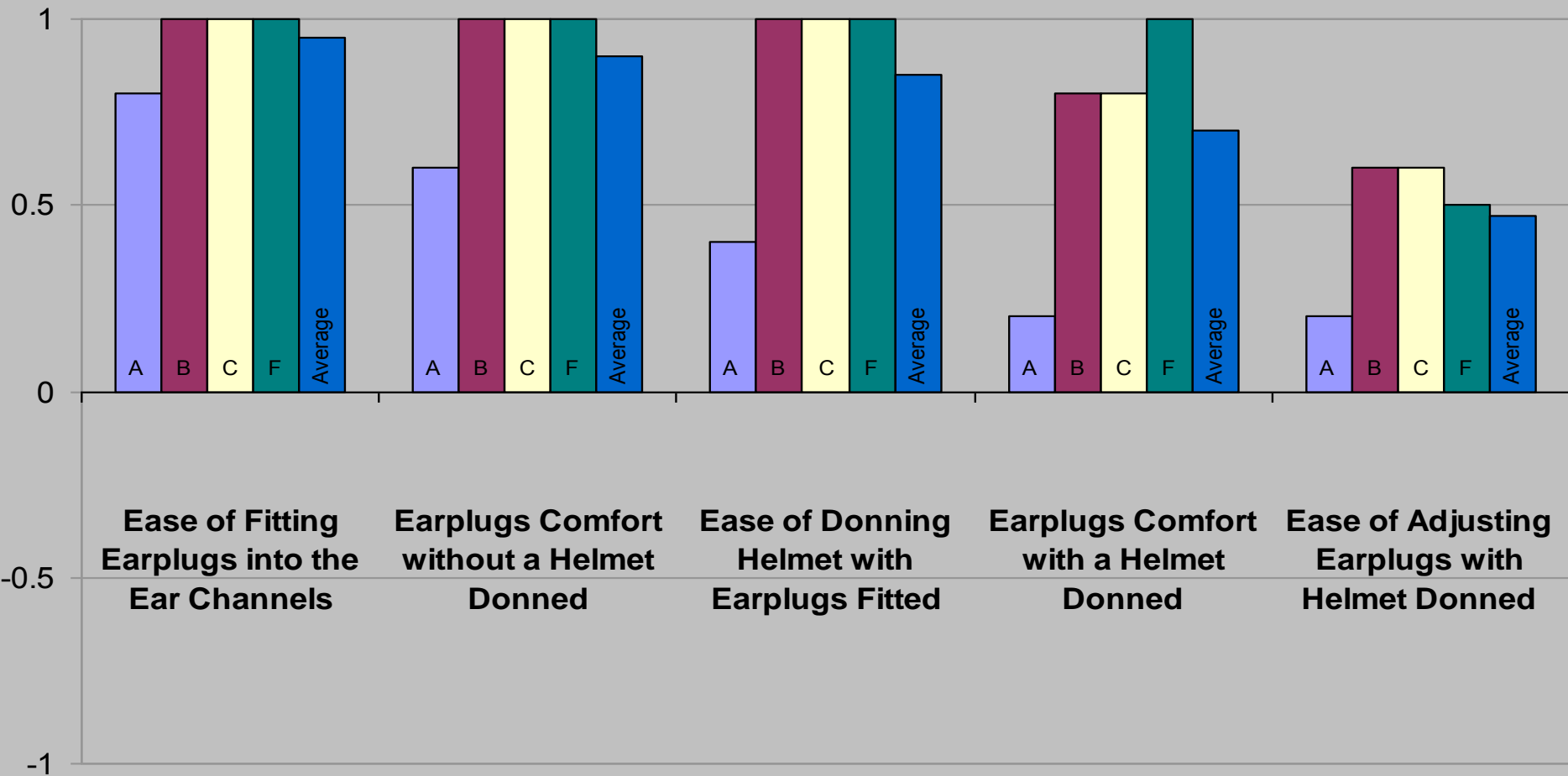
# Flight Trial

- Methodology
  - 1 Flight Per System Per Subject
- Subjects Completed Questionnaire Following Flight
  - Satisfactory (1)
  - Unsatisfactory (0)
  - Unacceptable (-1)
- Average Obtained And Plotted In Chart



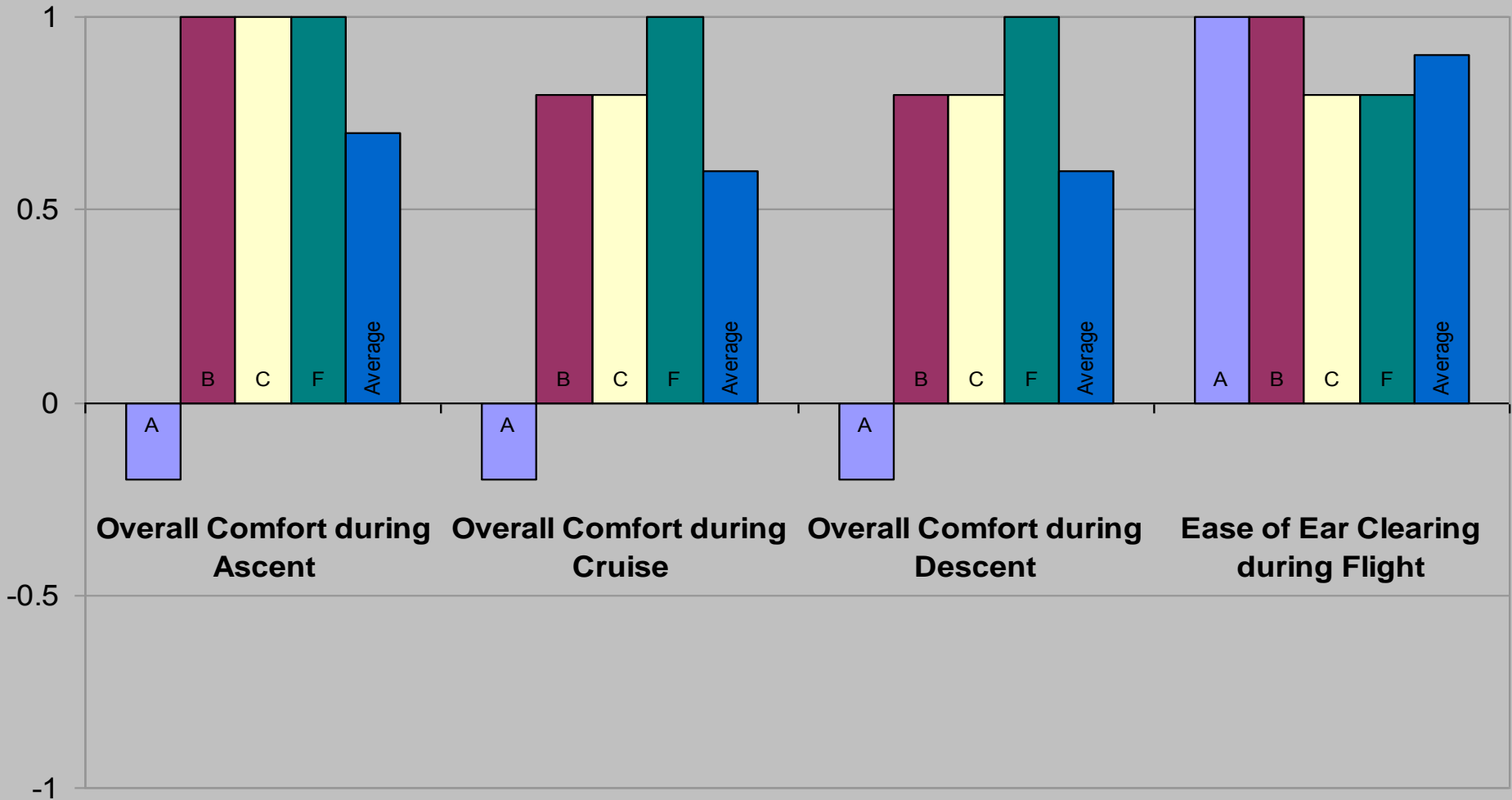
# Results

Interaction with helmet donning



# Results

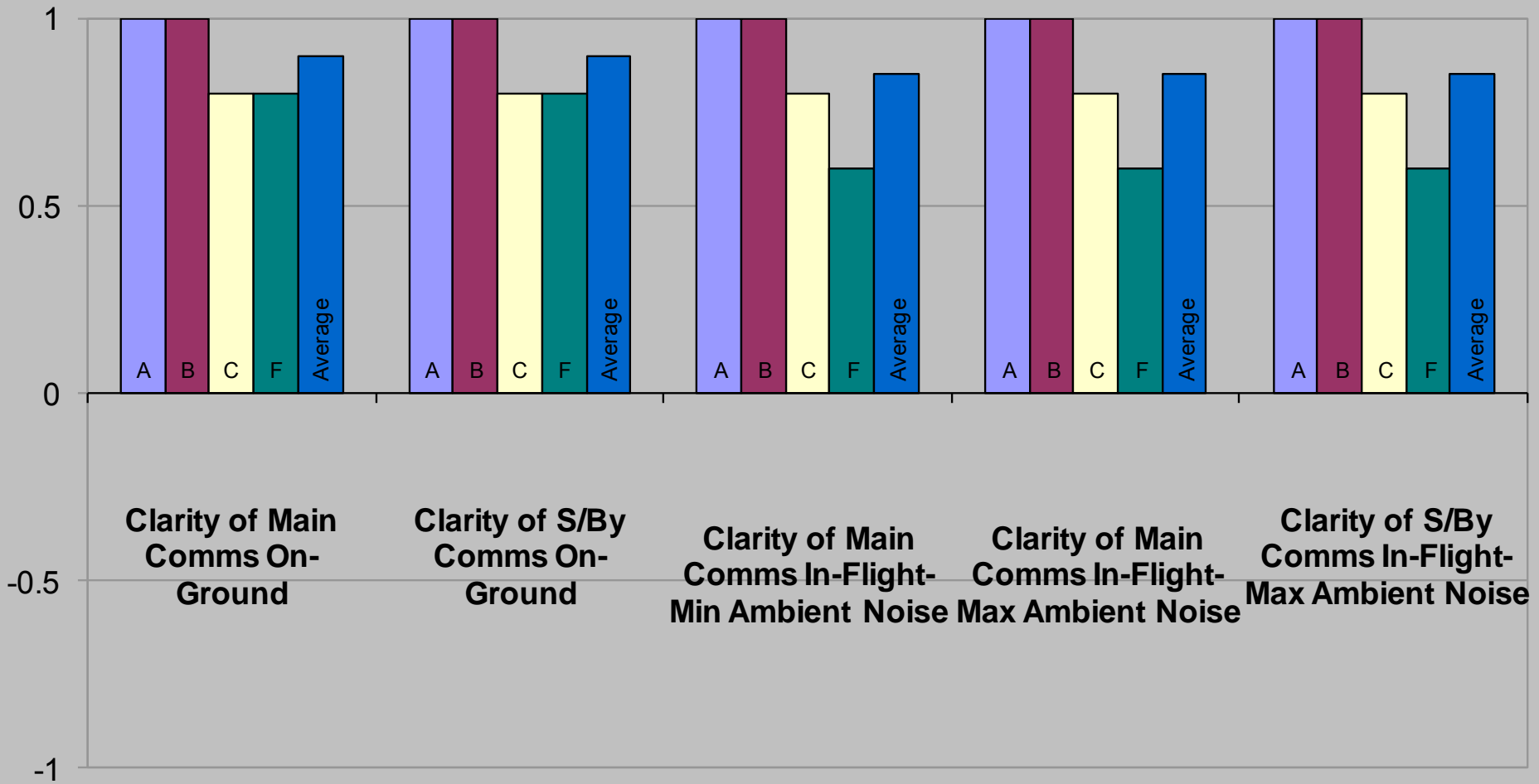
In-flight Comfort





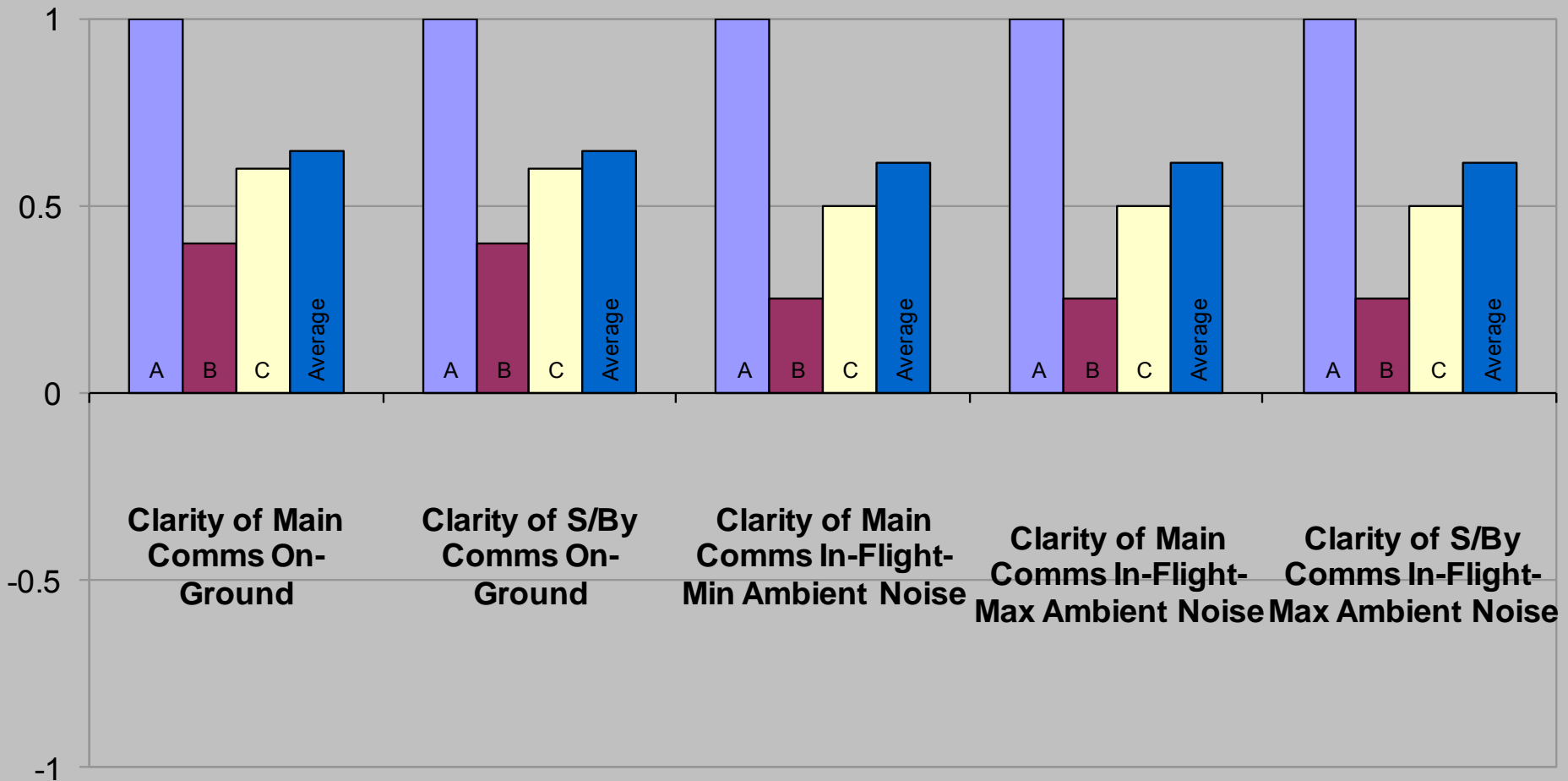
# Results

Comm Quality With Earplugs Working



# Results

Comm Quality With Ear Plug Not Working



# Discussion

- Custom Moulded Again More Comfortable
- IECD “A” And “B” Rated Higher On Comm Quality When Working
  - Followed By “C” Then “F”
- IECD “A” Outperformed Custom Moulded In Comm Quality When IECD Not Working
  - Followed By “C” Then “B”



# Comments

- Too Much Noise Protection With Custom Moulded
- Volume Set To Min When IECD Working
- Volume Set To Max When Not Working
- Audio Alarm Too Loud



# Conclusions

- Custom Moulded More Comfortable Than IECD “A”
  - Trial Not Long Enough For Acclimation To IECD “A”
- IECD “A” Rated Better In Flight Performance
- Unable To Say One Is Better Than Other



# Conclusions

- IECD “A” Is Flight Ready
- Work Is Needed On Custom Moulded Systems Trialled To Make Flight Ready
- Work Is Needed On All IECD To Integrate To
  - Helmet
  - Aircraft

