COMMUNICATION EARPLUGS
IN MILITARY AVIATION
- A QUESTIONNAIRE FOR PILOTS IN FINLAND

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I have no financial relationships to disclose.

I will not discuss off-label use and/or investigational use in my presentation.
In this presentation

• What is already known about communication earplugs (CEP) in military aviation settings
  – Communication challenges
• Survey design
• Results
• Discussion
Introduction: Communication challenges in military aviation

• Military pilots are exposed to high noise levels
  – hearing and communication problems can be flight safety issues and they may compromise operational effectiveness
  – Hearing loss – occupational hazard

• Cabin noise levels in military jet aircraft are 95-115 dB
  – 98-100dB in the aircraft used in FiAF (Kuronen 2004)

• Radio speech communication problems are common: they were reported to occur during 14% of flight time in Finnish military aviation
  – High background noise was reported to be one of the most prevalent problems (Lahtinen 2010)

• The sound attenuation of new JHMCS helmets is not ideal
  – Additional hearing protection is needed and 93% of Finnish military pilots are willing to use it (Lahtinen 2010)
Communications ear plugs (CEP)

- Microphone-speaker pair added to an earplug
  - Enables loud noises to be reduced and softer noises can be amplified
  - Need to allow equalization of pressure while altitude changes
- CEPs improved speech intelligibility in noise when compared to flight helmet only
  - Especially among pilots with hearing impairment; many were able to achieve normal performance in speech intelligibility tests when CEPs were used (Ribera et al 2004).
- Despite their advantages, the pilots do not always prefer to use CEPs:
  - In a survey among F-22 pilots, 16% of the pilots preferred not to use them
  - As many as 81% of the respondents had problems with the CEPs
  - 78% reported discomfort issues (Koda 2009)
Background and methods of this study

- In Finnish Defence Forces, one CEP type (OMARA®, Amplifon) has been available for fighter pilots and helicopter pilots since 2008
  - system includes pressure-equalizing filter
- We wanted to discover
  - how commonly CEPs are used
  - do the pilots find them useful in their duties
  - have they encountered any problems associated with the CEPs
- An anonymous questionnaire about the use of CEP's was conducted in all flying squadrons in Finnish Defence Forces.
  - Altogether 246 questionnaires were sent to pilots.
- The questionnaire consisted of 32 questions
  - 12 considered background information
  - 5 considered aviation radio communication problems in general
  - 15 considered the issues about CEPs.
Results: general information

• 146 pilots (127 fixed wing and 19 helicopter pilots) returned the survey.
  – Response percent 59%
  – Mean age: 32 years (23-51)
  – Native language: Finnish for all but one pilot
  – Current aviation language: English 96%, Finnish 4%

• Current task:
  – Active pilot: 85%
  – Staff pilots / headquarter tasks: 11%
  – Other: 4%

• Current primary aircraft type:
  – Fighter aircraft: 78%
  – Helicopters: 13%
  – Transport / liaison /primary trainer aircraft: 9%
Results: CEP use

- 93% of the respondents (136 pilots) had used or at least tried CEPs
- Currently CEPs are used by 62% of the pilots (63% of fixed wing pilots, 53% of helicopter pilots)
- Duration of use: mean 2 years 9 months (range 2-54 months)
Results: the positive experiences of CEPs

- CEPs enhanced the experienced speech intelligibility: 82% of the pilots who have used or tried CEPs said that they improve speech intelligibility in difficult hearing circumstances.
- It appears that CEPs may have a positive effect on tinnitus after flight tasks:
  - 35 pilots reported that tinnitus has decreased since they started using CEPs.
Results: comparison of previous equipment with CEPs:

**CEP vs. Flight helmet alone (n=132)**
- CEP is better: 87%
- CEP is equal: 5%
- CEP is worse: 8%

**CEP vs. Ear plugs (n=115)**
- CEP is better: 80%
- CEP is equal: 12%
- CEP is worse: 8%

**CEP vs. Head set (n=90)**
- CEP is better: 71%
- CEP is equal: 8%
- CEP is worse: 21%
Results: of the 38% not currently using CEPs, the reasons for not using:

Why you are not using CEPs (% of non-users)

- Broken / in maintenance: 34.5%
- Discomfort issues: 34.5%
- Not available for my aircraft / helmet type: 10.9%
- I don't believe I need it: 9.1%
- I don't have it: 7.3%
- Other: 3.6%
Of the pilots who have used or tried CEPs, 81% have experienced problems. They were asked to report all issues.

Problems with CEPs (% of the pilots who have used or tried CEPs):

- Helmet-cable malfunction: 55.6%
- Discomfort (outer ear): 42.2%
- Discomfort (inside ear canal): 28.1%
- Helmet pressure: 20.7%
- Too loose / poor fitting: 11.1%
- Pressure equalizing problems: 2.2%
- Other problems: 31.9%
In general, 85% would recommend CEPs to their fellow airmen or subordinates
Discussion

- The pilots approve CEPs and have noticed their advantages
- Still, complaints were relatively common. Less discomfort issues when compared to previous studies, but discomfort issues were a major reason for not using the CEP
- Problems with the cable connecting CEPs to helmet were common
  - Technical improvements
- Since outer ear discomfort was common, consider also helmet re-fitting
- Technical and maintenance issues were common
  - CEPs are a delicate technical device and need maintenance often, resulting in interruptions in use
- CEPs may improve operational effectiveness, since over 4/5 pilots reported that speech intelligibility is better in their working environment
Questions? Comments?
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